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G. Ya. BEI-BIENKO
and
L. L. MISHCHENKO

Locusts and Grasshoppers of the U.S.S.R. and Adjacent Countries

(Saranchevye fauny SSSR i sopredel'nykh stran)

Part I

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3 # PREFACE

This book represents a monographic review of locusts and grasshoppers of the U.S S. R. and adjacent countries, based on a critical study of all available literature on this subject and vast collections of the Zoological Institute of Academy of Sciences of the U.S S. R. All species of locusts and grasshoppers recorded in the territory of the U.S.S.R. and adjacent countries in Europe, Hither Asia, and the Far East are examined in this book. Within European borders are examined the Scandinavian countries, Poland, Czechoslovakia, Germany, Austria, Hungary, Bulgaria, and the northern part of Yugoslavia. Among Asiatic countries are examined Asia Minor, Iran (excluding its southern part), northern Afghanistan, Mongolia, western and northeastern China (Sinkiang, Manchuria, and all provinces adjacent to the south up to the Yangtze River), Korea, and Japan (excluding its southern part). In a few cases, in order to complete the picture, or because of other considerations, some species occurring beyond the limits of the mentioned territory were added.

The locusts and grasshoppers within the limits of the enormous area outlined above are characterized by a great variety of species A total of 833 grasshopper and locust species are examined in this book, 481 being recorded in the U.S.S.R. The description of these species is scattered over a vast, often almost inaccessible, specialized literature. Furthermore, there are no summarizing books at present embracing all the enormous territory of the U.S S.R. and corresponding to the contemporary level of knowledge of the grasshopper and locust fauna of the U.S.S.R. Owing to the above circumstances, the exact determination of many grasshopper and locust species, especially those distributed in Siberia, Kazakhstan, Middle Asia, and in the Caucasus, or inquiries into these species and their distributions, is extremely complicated for workers in the field of entomology and has become the domain of only a few experts. The primary aim of this book is to prepare a concise manual for the identification of species and for the acquaintance with fundamental features of the morphology, biology, ecology, taxonomy, and economic importance of the most important pests of plants—grasshoppers and locusts.

The fulfillment of this task was very difficult and entailed years of strenuous work, in view of the enormous amount of factual data on locusts and grasshoppers, which has accumulated in the U.S.S.R. since the October Revolution as a result of the large-scale development of research work. Naturally, it was difficult to achieve uniformity in the critical study of all the related problems in as extensive a book as this one. As a result some groups of locusts and grasshoppers were examined more thoroughly than
4 others which were sometimes included in the book only on the basis of reports in the literature

There is no doubt that the species composition of locusts and grasshoppers in the U.S.S.R., described in this book, is not complete, and important additions are possible by including species which have been found to occur in the neighboring countries and may also be found in the territory of the U.S.S.R., as well as by the possible discovery of species hitherto unknown to science. A number of keys will require certain amendments, or changes and our ideas on the distribution of a number of species may undergo important changes in the future. The authors express their hope that the publication of this book will facilitate the further study of locusts and grasshoppers and, by attracting new research workers, contribute to the progress of our knowledge of this theoretically and practically important group of insects.

The various parts of this book were divided between the authors in the following way. G. Ya. Bei-Bienko compiled the introduction and worked out the entire families Tetrigidae and Eumastacidae, the following subfamilies of the family Acrididae: Pyrgomorphinae, Egnatiinae, Oedipodinae and part of the Pamphaginae (of the tribe Thrinchini). L. L. Mishchenko worked out in their entirety the vast subfamilies Catantopinae and Acridinae, as well as a part of the subfamily Pamphaginae (of the tribe Pamphagini). Complete drawings were done by the artists F. I. Gunyaev, N. N. Kondakov, and S. M. Shteinberg. Drawings of structural details were done by the artist V. N. Lyakhov, by I. A. Chetyrkina, and by the authors.

This book is divided into 2 parts because of its size. The first part, comprising issue No. 7 of "Small Fauna" (Malaya Fauna), contains the introduction, the entire families Tetrigidae and Eumastacidae and the subfamilies Catantopinae, Pyrgomorphinae, Pamphaginae, and Egnatiinae of the family Acrididae. The second part contains the subfamilies Acridinae and Oedipodinae as well as the alphabetical index.†

A total of 433 locust and grasshopper species belonging to 132 genera are examined in this book: 27 species of the family Tetrigidae, 29 species of the family Eumastacidae, 227 species of the subfamily Catantopinae, 124 species of the subfamily Pamphaginae, 13 species of the subfamily Pyrgomorphinae, and 13 species of the subfamily Egnatiinae. Asterisk (*) denotes species recorded in the territory of the U.S.S.R., exclamation mark (!) denotes new data on distribution of species.

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† [The translators have included this index in the translation for the reader's convenience.]

TRANSLATION EDITOR'S NOTE. Classification embracing genus and all forms below genus are underlined, where genus and species only occur, they are both underlined and letterspaced.

INTRODUCTION

DESCRIPTION OF LOCUSTS AND GRASSHOPPERS

Locusts and grasshoppers (Acridoidea) represent a special superfamily (or, in the opinion of some authors, a suborder) of Orthoptera and have all the typical features of this order incomplete metamorphosis, elongated body, jumping hind legs, gnawing mouth parts directed downward, a well-developed pronotum covering the thorax from above and from the sides, narrow tegmina and wider wings (if these organs are developed) folding fan-like, and unsegmented cerci at the tip of the abdomen.

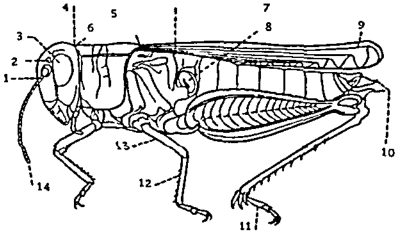

Figure 1 Body of female Calliptamus italicus (L.) side view (left pair of wings removed) (Original)

1—front 2—ocellus 3—eye 4—head 5—thorax 6—pronotum 7—abdomen 8—tympanic organ 9—wings 10—ovipositor 11—tarsus 12—tibia 3—femur 14—antenna

The superfamily Acridoidea is characterized (Figure 1) by relatively short antennae usually not more than half the length of the body and consisting of not more than 26 28 segments, 3-segmented tarsi on the hind legs, short ovipositor in the female bearing 2 pairs of valves visible from the outside, and short, hard, and unsegmented cerci Tympanic organs,

if developed, are always situated on the sides of the first abdominal seg-
6 ment. Eggs are laid in masses, usually protected, and arranged in the form of a pod [the ootheca] (Figure 29).

The superfamily is subdivided into 5 families, only 3 families of which, namely, Tetrigidae, Eumastacidae, and Acrididae are represented in the U.S.S.R.

BODY STRUCTURE

Head (Figures 1-5). Oval, or triangular, rarely conical (Acrida oxycephala Pall., Pyrgomorpha conica Ol., and others). The anterior surface of the head is called the frons, which may be vertical, or sloping caudad when examined in profile. Along the middle of the frons passes the frontal ridge, which is distinctly elevated; it usually extends downward to the end of the frons, i.e., to the transverse suture, which separates the front from the clypeus. The frontal ridge may either be flat, or have a longitudinal groove or depression; the lateral margins of the frontal ridge may be parallel, or diverging; straight, or curved. In the family Tetrigidae the frontal ridge under the ocellus appears like a single carina, bipartite at the ventral border of the frons and forming a triangular area there. The degree of sloping of the frons and the structure of the frontal ridge are of great importance in the systematics of locusts and grasshoppers. The ocellus is situated approximately in the middle of the frontal ridge; another pair of ocelli are situated on the sides of the upper part of the frons, near the anterior margin of the compound eyes. Rounded antennal sockets harbor the bases of the antennas and are situated at the sides of the frontal ridge, usually somewhat above the level of the ocellus. A thin ridge passes lateral to the antennal sockets, extending approximately from the lateral ocellus downward to the ventral border of the frons. These ridges (one on each side of the frons) are called accessory facial carinas. Depressed lines extending from the ventral margin of the eyes to the ventral border of the frons are situated lateral to the accessory facial carinas, immediately under the compound eyes. These are subocular sutures, separating the lateral parts of the frons from the genae, situated behind. The dorsal border of the frons is contiguous with the vertex, either extending directly into it, or separated from it by an arcuate transverse ridge.

The vertex forms the upper part of the head, situated between the eyes and projecting, sometimes very strongly, in front of them; hind part of the vertex borders on the occiput. The anterior part of the vertex, situated in front of the eyes, usually forms a distinct, often triangular, or pentagonal area, the fastigium, sometimes called the apex of the vertex; the margins of the fastigium are limited by a ridge, the apex of the fastigium is sometimes separated from the frontal ridge by a transverse ridge or carina. The surface of the vertex may either be flat, or depressed, and sometimes with an elevated transverse ridge in the middle—the vertexal carina, which may extend onto the occiput. The surface of the vertex in profile may be horizontal, or inclined forward, forming with the frons a widely rounded right angle, or less rounded acute angle. Lateral margins of the fastigium may be sharp and border directly on the upper part of the frons, or blunted

and bear depressions—foveolae of a quadrangular, triangular, rounded, or irregular form Foveolae may be very noticeable when examined from above (Chorthippus Fieb , Stenobothrus Fisch , Dociostaurus Fieb , and other related genera), or not perceptible from above
7 (Ochrilidia Stål), when they are situated under the marginal ridge of the fastigium. In the subfamily Pyrgomorphinae the vertexal pits are situated on the same plane as the fastigium, occupy its anterior part, and are separated from each other by a longitudinal groove. In some cases, although foveolae are present, they are almost flat, or substituted by a series of emphasized dots (Arcyptera Serv., Euchorthippus Tarb , and others) For a number of representatives of the subfamily Pamphaginae (Asiotmethis Uv. and other genera) the presence of two types of foveolae is typical, preocellar, situated in the anterior part of the fastigium and almost contiguous in front, and superocellar, situated behind the previous ones immediately above the lateral ocelli (Figure 574). The structure of the vertex, foveolae, as well as the type of angle formed by the vertex and the frons are of considerable importance in the systematics of locusts and grasshoppers.

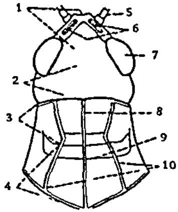

Figure 2 Head and pronotum of Pararcyptera microptera (F W) from above (According to Tarbinskii)

1—vertex 2—occiput 3—prozona of pronotum 4—metazona of pronotum 5—antenna 6—foveolae 7—eyes 8—median carina of pronotum 9—posterior (basal) transverse groove of pronotum 10—lateral carinas of pronotum

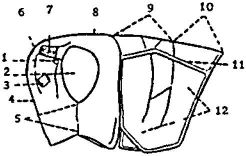

Figure 3 Head and pronotum of Pararcyptera microptera (F W) from the side (According to Tarbinskii)

1—lateral ocellus 2—eye 3—antennal base 4—front 5—subocular groove 6—vertex 7—left vertexal pit 8—occiput 9—prozona of pronotum 10—metazona of pronotum 11—lateral carina of pronotum 12—lateral lobe of pronotum

The ventral margin of the frons borders has a special transverse plate—the clypeus, the ventral margin of the latter borders has a large, flexible transverse plate, the labrum, which covers the mouth parts from above

Antennae and the mouth parts are appendages of the head The length of the antennae very seldom equals that of the whole body, but usually they are

shorter than half the body. The length of antennae is usually given in comparison with the length of the head and the pronotum combined, when the antennae are conceived as being bent straight caudad. As regards their shape, the antennae may be filiform, clavate (club-shaped), i.e., thickened at the end, or ensiform (sword-shaped), i.e., flat and wide at the base and tapered toward the apex (Acrida L., Truxalis Fabr., Ochrilidia Stål, and others). In some cases the antennae have an unusual shape (Phlocerus F.-W. and some tropical Tetrigidae and Eumastacidae). The structure and length of the antennae are widely used in the systematics of locusts and grasshoppers

8 The mouth parts are of the usual gnawing type and consist of a pair of strong and hard, unsegmented mandibles (Figures 6-9) bearing denticles on their inner side, a pair of segmented maxillae, and an unpaired, segmented labium. Each maxilla bears a 5-segmented palp, the labium bears a pair of 3-segmented palpi. Morphological characters of the mouth parts were not usually used for purposes of identification and systematics of locusts and grasshoppers, although S. Petrov in 1908 had already indicated that structural features of the mandibles were typical of different species. The mouth parts attracted the attention of taxonomists only in the case of unusual structure, for example, widened apical segments of maxillary palpi (some Myrmeleotettix Bol. and Stenobothrus Fisch.) or strongly-developed labium (Xenochtela Uv.). However, the dependence of the structure of the mandible on the type of food is very clearly expressed. Species feeding on broad-leaved vegetation are characterized by sharp incisors (i.e., denticles of the apical part of the mandible) and angular molar denticles, which correspond to cavities on the opposite mandible, while species feeding on

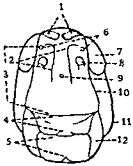

Figure 4. Head of Paracyptera microptera (F.-W.), front view. (Original)

1—foveolae, 2—frontal ridge, 3—frons, 4—clypeus, 5—labrum, 6—lateral ocelli, 7—eye, 8—antennal base, 9—median ocellus, 10—accessory, or lateral facial carina, 11—gena, 12—mandible.

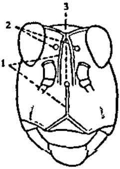

Figure 5. Head of Tetrix subulata (L.) front view. (According to Tarbinskii)

1—frontal ridge 2—lateral ocelli 3—median ocellus.

molar part. The incisors serve to break up, and the molar denticles to masticate the relatively soft leaves (the first type), or to crush the coarser grasses (the second type). The first type prevails in the subfamily Catantopinae, the second—in the subfamily Acridinae. Intermediate structure, indicative of feeding on both types of food, is characteristic of the majority of Oedipodinae. The adduced data indicate that mouth part structure may be of importance not only for systematics, but also for the understanding of the ecology of locusts and grasshoppers, and particularly of their modes of life (see page 49)

Thorax Consists of 3 segments pro-, meso-, and metathorax The prothorax is more developed than the other two segments, and is covered from above and from the sides with a large plate which hangs over the sides —the pronotum (Figures 1-3). The shape and structure of the pronotum vary greatly. It may be cylindrical, conical (i. e., tapered anteriad), saddle-shaped (i. e., more or less cylindrical in the anterior part and widened caudad), roof-like (i. e., sloping doubly lengthwise), constricted (i. e., narrowed in the middle and widened at both ends), or sometimes of an irregular shape. In the majority of cases the hind part of the pronotum covers only the mesothorax and partly the metathorax, i e , the pronotum is relatively short, but in the family Tetrigidae the pronotum is produced caudad and covers the whole of the abdomen from above. The dorsal part of the pronotum is called the disc, while the plates, hanging over the sides, are called the lateral lobes The disc almost always has a convex ridge in the middle—the median carina, and in addition, longitudinal lateral carinas are often present on the sides of the disc, one on each side. The median carina may be low, linear or elevated in the shape of a comb, which may be entire or cleft into lobes. The lateral carinas are never high, and are either straight (parallel, or diverging caudad) or unevenly concave in the middle part when they are sometimes obliterated, in some cases never reaching the anterior or posterior margins of the pronotum Light stripes may sometimes be present instead of lateral carinas, thus creating the impression of carinas, although the latter may be entirely lacking The surface of the pronotum is usually cut by 1-3 transverse grooves, the degree of whose development may vary They either cut the median carina, dividing the latter into separate lobes, or, if the median carina is elevated, the grooves, especially the two anterior ones, are barely perceptible The posterior transverse groove is usually more noticeable than the two preceeding ones, and is called the basal groove. Its position varies in relation to the middle of the pronotum, often it is described as the transverse groove (without the adjective "posterior") This groove divides the pronotum into two parts anterior, or prozona, and posterior, or metazona

Lateral lobes of the pronotum are either vertical or project laterally in their posterior part. Sometimes their posterior angles (situated on the border between the posterior and ventral margins of the lobes) are not of the usual rounded shape, but project as acute angles, or bear a small, triangular process (some Sphingonotus Fieb.), and in some cases they bear a long, sharp spine (many Scelimeninae of the family Tetrigidae). The anterior angles of the lateral lobes (on the border of their anterior and ventral margins) are sometimes also produced in the shape of acute angles (Sphingoderus B -Bienko, Strumiger Zub.). The height of the lateral

lobes in relation to their length may vary. In a number of cases the height is more than the length, but sometimes the lateral lobes are elongated lengthwise, and in that case their length becomes greater than their height (Mesasippus Tarb. and others). The above described structural features of the pronotum and its lateral lobes are of considerable importance in the systematics of locusts and grasshoppers.

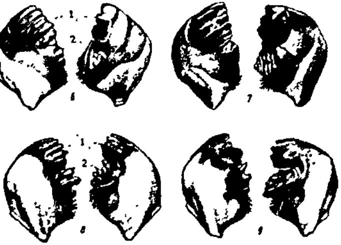

Figure 6-9. Mandibles of locusts and grasshoppers. (Original)

6—Ramburiella turcomana (F.-W.) and 7—Locusta migratoria (L.) (feed on cereal grasses), 8—Calliptamus italicus (L.) and 9—Conophyma almasyi rugosum Mistsh. (feed mainly on soft broad-leaved vegetation).

1—incisors, 2—molar denticles.

The ventral part of the prothorax, the prosternum, bears the anterior pair of legs, and is of great importance in the systematics of locusts and grasshoppers. The area of the prosternum between the bases of the anterior legs may be smooth, or may bear a small tubercle (Mesasippus Tarb., Aeropedellus Uv., Arcyptera Serv., and others), or a strong process of variable shape (subfamily Catantopinae). Sometimes the anterior margin of the prosternum is strongly and lamellately elevated and forms a collar [?], which covers the mouth parts from below (Tetrigidae, many Pamphaginae and Pyrgomorphinae). Lateral parts of this collar are fused with the episterna of the prothorax, the episterna being special platelets, adjacent to the ventral margin of the lateral carinas of the pronotum at their anterior angle, and sometimes strongly developed (Strumiger Zub.).

In the winged forms the meso- and metathorax are covered dorsally with the flight organs; usually the meso- and metathoracic features are not used in identification of locusts and grasshoppers. In the apterous forms the upper half-rings of these segments, the meso- and metanotum, are often

uncovered and may have *some minor identifying characters* *variations in* the structure of their surface (rugose, dotted, etc.) and longitudinal carinas. The ventral half-rings, the meso- and metasternum, are tightly fused together and form a common thoracic plate (Figure 10), however, this thoracic plate is sharply subdivided into meso- and metasternum by a strongly curved transverse groove This transverse groove is usually sharply bent in the middle, and as a result the middle of the anterior margin of metasternum intrudes between the lateral parts of the mesosternum which are known as the lateral lobes of the mesosternum The part of the metasternum situated between the lobes is designated as the space between the lateral lobes of the mesosternum. The metasternum also has a notch in the middle of its posterior margin, in which is situated the process of the first abdominal segment, hence, the metasternum too is divided into lateral lobes with a space between them The shape of these lobes, especially that of the mesosternum, as well as the width of the space (i.e., its diameter) in relation to its length and to the width of the lateral lobes are of considerable importance in the systematics of locusts and grasshoppers A correct understanding of their structure is therefore very important, otherwise gross errors in the determination of species are possible Very often the transverse groove of the mesosternum (the groove that separates the mesosternum from the metasternum) extends from the middle toward the external margins of the mesosternum, thus separating the lateral lobes from the rest of the mesosternum, as a result of which the lobes become sharply outlined along their anterior margin In this case the transverse groove of the mesosternum resembles a straight transverse line, which may sometimes be concave caudad in the middle, in the area of the space between the lateral lobes (subfamily Egnatiinae, some Pamphaginae—Figures 98, 806, and 807)

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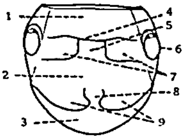


Figure 10 Thoracic plate (meso and *metathorax*) of Calliptamus italicus (L.) from below (Original)

1—mesosternum 2—metasternum 3—first abdominal sternite 4—transverse *groove of mesosternum* *5—space be*tween lateral lobes of mesosternum 6—coxal pits 7—lateral lobes of mesosternum 7—space between lateral lobes of metasternum 9—lateral lobes of metasternum

The lateral parts of the meso and metathorax (Figure 11) are formed by compact side pieces, or pleurae, separated by an oblique suture The
12 second pair of thoracic spiracles is situated in the ventral part of the pleurae (above the base of the middle legs), the first pair of thoracic spiracles is usually situated below the posterior angles of the lateral lobes of the pronotum, and therefore is not perceptible from the outside Each pleura is divided by an oblique suture into two plates anterior, or episternum and posterior, or epimeron each episternum and epimeron having a convex ridge on the ventral margin which limits the coxal cavities—the place where the legs are articulated The pleurae may be smooth, have impressed dots, or bear tubercles the ridges that limit the pleurae from below have a different degree of convexity in different species The outline of the frame

surrounding the second thoracic spiracle, is also sometimes different in certain species (e.g., in genus Sphingonotus Fieb. and in other close genera).

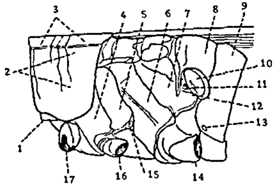


Figure 11. Thorax of Calliptamus italicus (L.), side view (left pair of wings removed). (Original)

1—episternum of prothorax, 2—lateral lobes of pronotum 3—disc of pronotum, 4—episternum of mesothorax, 5—epimeron of mesothorax, 6—episternum of metathorax, 7—epimeron of metathorax, 8 and 9—first and second abdominal tergites, 10—tympanic organ, 11—first abdominal spiracle, 12—tympanic lobe, 13—second abdominal spiracle, 14, 15, and 16—coxas of 1-2 pairs of legs, 17—second thoracic spiracle.

The appendages, the legs and the wings, are articulated to the thorax. Each pair of legs consists of the basal segment, the coxa, small and poorly perceptible trochanter, long femur, similarly long tibia, and a 3-segmented tarsus (Figures 1, 12). Only in the family Tetrigidae do the front and the middle pairs have 2-segmented tarsi. The front and the middle pair are walking legs, similar in size and proportions of their separate parts, and are always smaller than the hind pair. The hind pair (Figure 12) is a jumping one and is characterized by larger size, stout basal parts of the femora, two rows of spines, outer and inner, on the dorsal margin of the tibia, and longer tarsi. Femora of the hind legs are usually strongly compressed from the sides and are gradually tapered apicad, where the somewhat widened genicular part is situated. The following carinas run along the hind femora: dorsal carina, which separates the outer surface of the femur from the inner one, and is usually strongly convex and sharp; ventral carina, which is situated on the opposite side and is also usually sharp; and a pair of outer and inner carinas. The dorsal carina is sometimes sinous, or serrate, but in certain cases these characters are typical for the ventral carina, or even for the outer ones. The outer aspect of the femurs between the two outer carinae usually have plumosely arranged areas, but in the subfamily Pamphaginae and Pyrgomorphinae these areas are of an irregular form and

13 have irregularly spaced tubercles and ridges. In all the 3 families of locusts and grasshoppers examined in this book, the ventral aspect of the femora between the ventral and ventro-internal carinae have a small, projecting papilla—Brunner's organ. This organ is entirely absent only in the South American family Proscopiidae and the South African family Pneumoridae, both characterized by the inability to jump. The genicular part of the hind femora is distinctly widened, and thus clearly distinguished from the rest of the femur having certain structures which are important for the identification of locusts and grasshoppers. The dorsal and ventral genicular lobes form the lateral surfaces of the genicular part and are separated from each other by an incision on the posterior margin. They may have different contours, and are sometimes armed with a spinule behind (many Eumastacidae and certain Acrididae). Sometimes the dorsal carina of the hind femur, which extends onto the dorsal aspect of the genicular part, ends at the posterior margin of the latter with a spinule (many Eumastacidae and certain Acrididae).

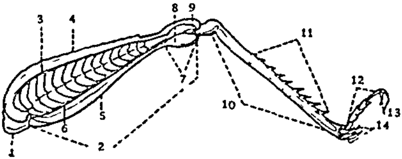


Figure 12 Hind leg of Calliptamus italicus (L.) outer side (Original)

1—coxa 2—femur 3—dorso-external carina of femur 4—dorsal carina of femur 5—ventral carina of femur 6—ventro external carina of femur 7—genicular part of femur 8—ventral genicular lobe of femur 9—dorsal genicular lobe of femur 10—tibia 11—external row of spines 12—hind tarsus 13—tarsal claws 14—spurs

The tibiae are usually thinner than the femora and also have certain features important for identification purposes. The front and middle tibiae are usually cylindrical, seldom flattened laterally, and sometimes the front tibiae are greatly swollen in the shape of a pear (males Gomphocerus Thunb.) and the middle tibiae bear a row of tubercles, which play a role in chirping (Thrinchus F.-W. males, Asiotmethis Uv., and their relatives) The hind tibiae are somewhat swollen at the base where they may have a thin, transverse shading (Angaracris B.-Bienko), or a rough surface (Uvaroviola B.-Bienko). In the majority of cases, however, the surface of this thickened base is smooth, or dotted. The number of spines on the outer and inner margins of the hind tibiae is from 8-9 to 25 and more. In certain cases the inner spines are longer than the outer ones, which is characteristic of species associated with trees and shrubs (many

Eumastacidae, as well as Dericorys Fieb., Uvarovium Dirsh, and others); sometimes these spines are abbreviated and slightly flattened (Charora Sauss.).

In certain Chinese and tropical Scelimeninae of the family Tetrigidae (e.g., in Platygavialidium Günt.), which are able to swim in water, the lateral margins of the hind tibiae have almost no distinctly emphasized spines, but are greatly widened lamellately.

The presence of the outer apical spine (Figure 92) on the hind tibiae is characteristic of certain locusts and grasshoppers (a part of Catantopinae and Pyrgomorphinae and the majority of Pamphaginae), this spine being the terminal spine of the outer row and being situated directly at the base of the tarsus. In other locusts and grasshoppers (all Acridinae, Oedipodinae, and Egnatiinae; a part of Catantopinae and Pyrgomorphinae) this outer apical spine is absent. As a result the beginning of the outer row of spines is somewhat withdrawn from the apical end of the tibia, and the apical spine of the inner row has no corresponding spine on the outer aspect. Rarely both apical spines, the outer and the inner, are absent (Thrinchus F.-W. and Strumiger Zub.) (Figure 576).

The apical end of the hind tibia always bears two pairs of flexible spurs, situated almost under the tarsus, or at its sides which are sometimes strongly elongated, especially the inner pair. This is typical of sand-dwellers (Hyalorrhipis Sauss., Leptopternis Sauss., Strumiger Zub., certain Acrotylus Fieb. and Thrinchus F.-W., and others). The spurs may also be elongated unevenly and the dorsal inner spur may be considerably shorter than the ventral one (Heteropternis Sauss.).

The tarsi on locusts and grasshoppers (Figures 13 and 14) are in the majority of cases 3-segmented, except in the family Tetrigidae where the
14 front and middle pair of legs have 2-segmented tarsi. The first and the third segment are the longest, moreover the first segment bears 3 convex pulvilli on the ventral aspect which may be mistaken for segments when not carefully examined. In the family Tetrigidae they are usually plate-like and acute-angled. The last segment of the tarsus bears a pair of similar claws, but in certain Eumastacidae (e.g., in Gomphomastax Br.-W.) these claws are asymmetrical, the posterior (inner) being longer than the opposite one. There is often a large, rounded empodium between the claws. In a number of cases this empodium is weak and shorter than the claws (in locusts and grasshoppers living on soil), while in representatives of the family Tetrigidae it is entirely absent.

Normally there are two pairs of wings (Figure 15). The front pair, or tegmina, are elongated, rather narrow, usually leathery, and articulate with the mesothorax [mesonotum]. The hind pair of wings articulate with the metathorax [metanotum] and are more delicate and transparent than the tegmina, i.e., they are completely membranous and often brightly colored. Unlike the tegmina the wings are rather wide and capable of folding fan-like. In certain cases the tegmina and wings are strongly abbreviated (Figure 30), lobe-like, or even lateral, i.e., they are not contiguous on the dorsum, and are sometimes entirely absent (Conophyma Zub. and all Gomphomastacinae, living in the mountains of Middle Asia). Brachypterous grasshoppers are similar in external appearance to the larvae [hoppers] of common macropterous species, but in adult brachypterous species the tegmina are situated on the outer side and the wings are either entirely absent or hidden under the tegmina and shorter than the latter, whereas in the larvae [hoppers]

the narrow rudiments of the tegmina are situated between the wider, triangular rudiments of the wings. In the representatives of the family Tetrigidae the tegmina are always greatly abbreviated and lobe-like, while the wings are of normal length (Figure 40).

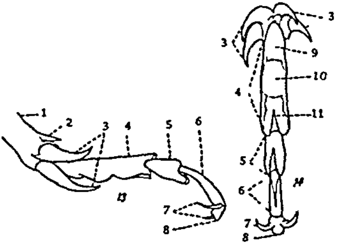


Figure 13 14 Hind tarsus of Calliptamus italicus (L.)
13—inner view 14—view from below (Original)

1—terminal part of tibia 2—inner apical spine 3—outer and inner pairs of spurs at the end of tibia 4, 5 and 6—1-3 tarsal segments 7—claws 8—empodium between the claws 9, 10 and 11—1 3 pulvilli of first tarsal segment

The arrangement of veins, or venation, is an essential feature of the
15 tegmina and wings. Different authors do not always use the same nomenclature with regard to the longitudinal veins. The nomenclature given below is based on the papers by A. V Martynov, and was used by Tarbinskii (1940), as being the most exact one These lengthwise situated veins are considered from the anterior margin of the tegmina or wings, and are called costal vein (C), subcostal (Sc), radial (R), median, or the true median (M), cubital (Cu), consisting of two branches anterior (CuA) and posterior (CuP), and two anal veins (1A and 2A) Some of these veins have branches. The radial vein has the greatest number of branches which are often considered as branches of a special vein-sector of the radius (RS), which extends from the radial vein caudad Secondary or spurious veins are often found among the above noted true veins, the median spurious vein, situated between the R and M, being of special importance, as it is a part of the
16 chirping organ in the subfamily Oedipodinae The following fields are situated between the true longitudinal veins anterior, or precostal (in front of C), which is present only on the tegmina, costal (between C and Sc), subcostal (between Sc and R), radial (between R and M), median (between M and CuA), cubital (between CuA and CuP), and the anal (behind 1A). Hence the fields are designated according to the name of the vein which extends along the anterior margin of the field The following 3 wing areas should also be distinguished preanal, which occupies the whole area

in front of 1A; anal, situated between the first (1A) and the second (2A) anal veins; and jugal, which occupies the hindmost part. On the tegmina this jugal area appears at the base of the posterior margin of the tegmina as a small fold, bending under the tegmina when the wings are folded along the body; on the wings the jugal area forms the fan of the wing and has longitudinal veins (Ju) situated lengthwise and sometimes strongly thickened (Helioscirtus Sauss., Bryodema Fieb., and others).

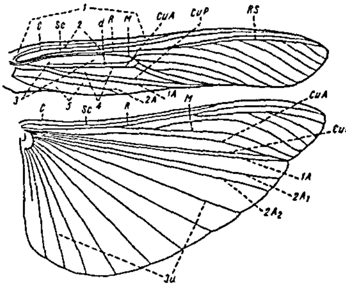


Figure 15 Tegmina and wings of a grasshopper with a delineation of veins and some fields. (Original)

Veins: C—costal, Sc—subcostal, R—radial, RS—sector of radius; M—median, d—median spurious vein, CuA—cubital anterior, CuP—cubital posterior; 1A, 2A ($2A_1$, $2A_2$)—first anal and second anal, Ju—jugal (on hind wing). Fields: 1—anterior, 2—costal, 3—median, 4—cubital, 5—anal.

The given table compares the nomenclature of veins, fields, and areas accepted in this book with that of other authors.

17 Abdomen. An elongated, usually conical, hind part of the body, divided into 10 segments (Figure 1). The dorsal half-rings, or tergites, are connected on the sides of the abdomen with the corresponding ventral half-rings, or sternites, by means of thin, elastic side pieces, the pleurae. There is a disparity between the number of tergites and sternites, because certain terminal sternites are atrophied. Both sexes have 10 distinct tergites, while the number of sternites is 9 in the male and 8 in the female. The majority of abdominal segments are of a similar structure, only the first segment (taken from the thorax) and the terminal, or genital

segments have a number of features important for the identification of locusts and grasshoppers. All alate and brachypterous species, as well as some apterous representatives of the family Acrididae have on the side of the first abdominal segment an opening of a variable form covered with a transparent, shining membrane on the bottom. This opening and the membrane form the tympanic or auditory organ (Figures I, 96). The opening of the tympanic organ may be rather large and rounded, or appear like a narrow, curved slit, as a result of being unevenly covered with a large lamellate tympanic lobe (Figure 96). The degree of development of this lobe and the contour of the tympanic opening have recently been successfully used for differentiation of related genera and similar species of locusts and grasshoppers. Representatives of the families Tetrigidae and Eumastacidae lack this organ entirely. In certain locusts and grasshoppers (the majority of Pamphaginae) the sides of the second abdominal sternite bear a special rounded, rough plate—Krause's organ, which is common to both sexes (Figure 96). These insects produce a rustling or hissing sound by rubbing the base of the hind femur on this plate. This function of Krause's organ is, however, disputed by some authors.

Areas and fields		Venation	
Nomenclature accepted in this book	Jakobson 1905; Uvarov 1927a	Nomenclature accepted in this book	Jakobson 1905 Uvarov, 1927a
	A. Preanal area		
I Anterior, or precostal field	Anterior field	1 Costal (C)	1 Anterior
II Costal field	Humeral field	2 Subcostal (Sc)	2 Anterior radial
III Subcostal field	Exterior field	3 Radial (R)	3 Middle radial
IV Radial field		4 Median (M)	4 Posterior radial
V Median field	Median, or discoidal field	5 Anterior cubital (CuA)	5 Anterior ulnar
VI. Cubital field	Ulnar field	6 Posterior cubital (CuP)	6 Posterior ulnar
	B. Anal area		
VII Anal field	Anal field (partly)	7 Anal first (1A) 8 Anal second (2A)	7 Dividing, or anal 8 Axillary
	C. Jugal area		
		9 Jugal (Ju), only on hind wing	

The tip of the abdomen (Figures 16-19) is composed of altered genital segments and is of a complicated structure. A dorsally situated anal plate (epiproct) and a pair of lateral, usually triangular plates (paraprocts) are the rudiments of the eleventh segment and are situated behind the ninth and tenth tergites, the latter being tightly fused and short, because of obliterated ventral margins. The supraanal plate projects angularly caudad, its structure often being more complicated in the male than in the female, and often being

18 used for the identification of species and genera. A pair of lobules (furculae) of varying size and shape are sometimes present on the posterior margin of the tenth tergite, directly above the base of the supraanal plate. These lobules are widely used for the identification of many apterous and brachypterous Catantopinae. A pair of cone-like, or differently shaped processes—the cerci, are present on the sides of the supraanal plate, above the paraprocts.

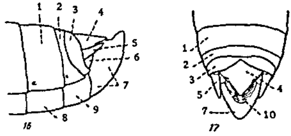
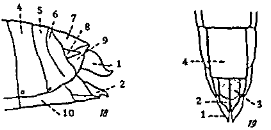


Figure 16, 17. Tip of abdomen of male Locusta migratoria (L.), from the side (16) and from above (17). (Original)

1, 2, and 3—tergites of 8-10 segments; 4—supraanal plate; 5—cercus, 5-paraproct; 7—subgenital plate (apical part of ninth sternite); 8 and 9—sternites of eight and ninth segments, 10—pallium.



Figures 18, 19. Tip of abdomen of female Locusta migratoria (L.), from the side (18) and from below (19). (Original)

1—dorsal valve of ovipositor, 2—ventral valve of ovipositor, 3—pulvilli at the base of ventral valves of ovipositor, 4, 5, and 6—tergites of 8-10 segments, 7—supraanal plate, 8—cercus; 9—paraproct; 10—sternite of eighth segment.

They are rudiments of the limbs of the eleventh segment. The cerci are usually more complicated and often larger in the male than in the female, and are often a good distinguishing feature between species. The abdomen ends ventrally with the so-called subgenital plate, formed in the male by the ninth and in the female by the eighth sternite. The subgenital plate of the male is swollen, its distal part usually bent upward and caudad and it represents the tip of the male's abdomen from behind. Dorsally it is partly covered by the supraanal plate and bears in its cavity the copulatory apparatus. The shape of

the subgenital plate of the male usually resembles a short, irregular cone, but sometimes it is strongly produced and sharpened caudad (Acrida L., Chrysochraon Fisch., and others), or bipartite at the apex (Thrinchus F.-W.), or differently shaped. The subgenital plate of the female differs from that of the male and is situated completely on the ventral aspect of the body and itself forms the elongated eighth abdominal sternite. The subgenital plate of the female usually has no specific structures; occasionally it has longitudinal carinas, which are sometimes serrate (certain Oxya Serv.), or its posterior margin may sometimes have minor morphological features: processes, notches and denticles. A short and hard ovipositor (Figures 18, 19) is situated between the subgenital and anal plates of the female. The ovipositor consists of 4 pairs of valves, but only two pairs, the dorsal and the ventral, are visible from the outside. Hence the abdomen of the female ends with an ovipositor, and not with the subgenital plate as in the male. The shape of the ovipositor varies in different species, hook-like and serrate being the most common types of ovipositors. The first is typical of species which lay eggs into the soil and is characterized by the presence of a bent apical part at the end of the valves (Chorthippus Fieb., Locusta L., Oedipoda Latr., Calliptamus Serv., and many others), the second
19 type is characterized by valves which are usually narrower, elongated, and serrate on their outer margin, and is adapted for laying eggs into the stems of plants, into plant debris, and other similar places (Chrysochraon Fisch., Oxya Serv., many Eumastacidae, and all Tetrigidae). The description of the copulatory apparatus of the male, which is of considerable importance in the systematics of locusts and grasshoppers, will be given below in the description of the reproductive organs.

Internal Organs. The internal organs of locusts and grasshoppers are structurally similar to those of other Orthoptera, but have, however, some important differences. The alimentary tract, in contrast with other Orthoptera, is short and only sometimes exceeds the length of the body. It is subdivided into the following sections, which differ in function, external appearance, and structural features of their inner walls: pharynx, short esophagus, always bearing longitudinal folds with spinules and bristles on its inner surface, a longer and wider crop, which has large transverse folds with rows of spinules on the inner side, the gizzard, which has 40-70 dental folds with spinules on the inner side, the mid-gut, or stomach, with 6 gastric caeca (only 2 in other Orthoptera) adjacent to its anterior margin, the stomach and the gastric caeca having smooth inner walls, devoid of spinules and being lined with glandular epithelium. Finally there is the hind-gut, not markedly separated outwardly into an anterior part and the rectum, but with only a slight constriction marking the beginning of the rectum. The shortness of the alimentary tract is, however, compensated by the presence of 6 gastric caeca, the total length of the latter together with all the length of the intestine being 2.6 times the length of the body in Locusta migratoria L. and 3.3 times the length of the body in Calliptamus italicus L.

Research by Bryantseva (1950a, 1950b) on the anatomy of the alimentary tract of locusts and grasshoppers and other Orthoptera showed that the cuticular structures of its anterior part vary considerably, are peculiar to individual subfamilies, families, and genera and may serve as a good criterion for identification and classification of locusts and grasshoppers.

Malpighian tubuels are situated on the border between the stomach and the hind-gut and consist of a considerable number of tubules (up to 300) often collected into several tufts, some directed forward and some backward. The function of these organs is not only secretory, but, as it was lately established, they accumulate flavin (i.e., vitamin B). The respiratory system is a complex of branched tracheae, 10 pairs of spiracles (2 pairs on the thorax and 8 pairs on the abdomen), which are the outer openings of the respiratory system, and air-sacs. The first pair of abdominal spiracles is situated in the sockets of the tympanic organs in special stigmal or spiracular cavities at the anterior margins of the tympanic organs, the rest being situated at the antero-ventral angles of the subsequent 7 abdominal segments, including the eighth. The location of the thoracic spiracles has been described above. The air-sacs play a role in regulating the body temperature, during the flight the temperature of the air inside the sacs being lower than that of the body (Strel'nikov, 1935).

The circulatory system consists of a dorsal vessel of the type common to insects, i.e., a long tube divided into a pulsating posterior section, the heart, which consists of a number of chambers, and an anterior part, the aorta, devoid of chambers and not pulsating. Besides, there is a pair of additional pulsating organs, the cephalic ampullae, situated at the base of antennae. The blood pH is between 6.0 and 7.6, and the blood corpuscles are represented by hemocytes of different sizes, the difference in size probably indicating the stage of their development. Besides hemocytes, fat droplets and muscular fibrils at different stages of decomposition are present in the blood. The total number of blood corpuscles per unit volume varies in different species, at different stages of development, and is affected by environmental factors. A thorough study of the above phenomenon may open new vistas. The nervous system is represented by an abdominal nerve chain of 8 ganglia (3 thoracic and 5 abdominal) and a cephalic section, which consists of a rather large supra-esophageal ganglion and a small sub-esophageal ganglion, connected by a peri-esophageal ring. Besides this, there is the sympathetic nervous system, connected with the central nervous system, and situated above the anterior section of the alimentary tract.

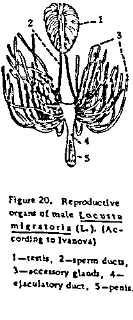


Figure 20. Reproductive organs of male Locusta migratoria (L.). (According to Ivanova)

1—testis, 2—sperm ducts, 3—accessory glands, 4—ejaculatory duct, 5—penis.

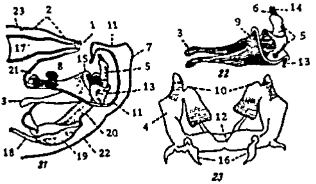
The endocrine system is represented by a pair of roundly-elongated or spherical accessory bodies (corpora allata) situated on the sides of the fore-gut behind the supra-esophageal ganglion and previously considered part of the sympathetic nervous system. It has now been proved that these bodies are organs of the endocrine system and secrete a hormone necessary for the development of the eggs. A pair of small elongated bodies (corpora cardiaca) situated above the esophagus are probably another organ of internal secretion.

The reproductive system of the male (Figure 20) is of a type common to Orthoptera and consists

of an outwardly unpaired testis, a pair of seminal ducts, unpaired ejaculatory canal, accessory glands, and the copulatory apparatus ending with the ejaculatory canal. The testis is actually a paired organ and consists of numerous, tightly approaching, seminal tubes, or follicles, numbering from 14 to 250 Three types of testes were established radial (the follicles arranged along the basal part of the seminal duct), fountain (the follicles collected into a tuft at the blind end of the seminal duct); and intermediate. The above described types of testes may be characteristic of individual species, but cases are known where all 3 types were observed in one and the same species. The radial is the initial type, has the greatest number of tubes (up to 250), and appears before other types during the postembryonic development. The number of follicles varies in different representatives of the same species, but the average number is probably
21 typical of individual species The secretions of the accessory glands are used for the formation of special vessels containing the semen of the male, the spermatophores, which take part in the fertilization of the female during pairing

The copulatory (or internal genital) apparatus of the male (Figures 21-23) is situated inside the cavity of the subgenital plate It is covered from above with a soft pallium, is of a complicated structure, strongly sclerotinized, and consists of the following parts penis, or aedeagus, with adjacent structures, basal fold, and epiphallus. The penis consists of an elongated dorsal lobe, strongly projecting above the caudad-bent pallium during pairing and a lamellate ventral lobe. The distal part of the ventral lobe is, in its turn, divided into the dorsal (or anterior) and ventral (or posterior) processes, which are cut longitudinally into 2 halves, the right and the left, by the external genital opening The lateral walls of the base of the dorsal lobe are usually strongly sclerotinized and project forward as a pair of processes or apodemes of the penis and are covered by the basal fold from above. The bases of the apodemes are united in their anterior part and form a solid zygoma. This whole structure together with the apodemes is called the cingulum. The basal part of the penis is formed by the endophallus. The walls of the latter are covered with muscular fibers, as a result of which this whole part resembles a muscular capsule, which serves as a pump, into which opens the ejaculatory duct

22 The basal fold is a special cloak-like structure situated at the bottom of the genital cavity. It covers the anterior part of the penis and the cingulum from above. A peculiar sclerite, the epiphallus (Figure 24), lies above the anterior part of the basal fold, immediately under the hind-gut, the latter, in its turn, being covered by the anal plate. The epiphallus is attached to the ninth sternite and to the zygoma by muscular tissues The epiphallus is a transverse structure, consisting of lateral plates joined together by a narrow, often arcuate bridge of the epiphallus Each of the lateral plates bears a hook-like anterior process on its anterior part and a large, dorsally projecting comb, or posterior process, covered with spinules on its posterior part. In the subfamily Pamphaginae the epiphallus is of an entirely lamellate shape and has no bridge Structures that may definitely be considered an epiphallus are absent in the family Tetrigidae



Figures 21-23. Male's genital armature. (Figures 21 and 22 according to Snodgrass, Figure 23 according to Boldyrev)

21—outline of structure; 22—penis and its apodemes, 23—epiphallus.

1—anal opening, 2—anal plate; 3—apodema of penis; 4—lateral plate of epiphallus 5—dorsal lobe of penis 6—dorsal (anterior) terminal process of penis, 7—genital plate, 8—genital cavity, 9—zygoma, apodema of penis, 10—posterior process of epiphallus, 11—pallium, 12—zygoma of epiphallus, 13—ventral lobe of penis, 14—ventral (posterior) terminal process of penis, 15—basal ridge (or fold) 16—anterior processes of epiphallus, 17—rectum, 18—ejaculatory duct, 19—ejaculatory sac; 20—endophallus, 21—epiphallus; 22—ninth sternite; 23—tenth tergite.

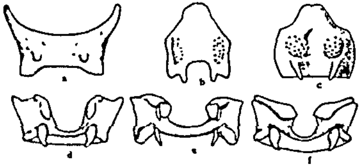


Figure 24 a-f. Epiphalli of various locust and grasshopper species. (According to Roberts, Tarbinskii, and Uvarov)

a—*Calliptamus italicus* (L.) b—*Strumiger desertorum* Zub., c—*Pezotmethis tartarus* (Saus.), d—*Acrida turrita* (L.) e—*Ramburiella turcomana* (F.-W.) f—*Oedipoda caerulescens* (L.)

A male copulatory apparatus which is of an entirely different structure and more simplified is typical of the family Tetrigidae The penis consists of two lateral plates, connected at their anterior part and forming there an unpaired median process armed with denticles A widely-opened membra nous cavity lies between the lateral plates, and the opening of the ejaculatory duct is at the bottom of this cavity The copulatory apparatus is covered dorsally by the pallium and is divided into two longitudinal lamellate valves

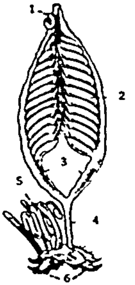


Figure 25 Reproductive organs of female Locusta migratoria (L.) (According to Pospelov)

1—tubular gland 2—ovary 3—paired oviduct ducts 4—single oviduct 5—spermatheca 6—valves of ovipositor

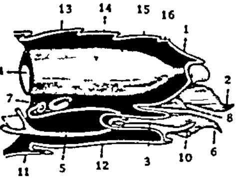


Figure 26 Longitudinal section (sketch) through tip of abdomen of female grasshopper with demar cation of part of reproductive organs and ovipositor (Original)

1—anal plate 2—dorsal valve of ovipositor 3—genital cavity with genital opening (below) and opening of spermathecal duct (above) 4—h nd gut 5—single oviduct 6—ventral valve of ovipositor 7—spermatheca 8—median valve of ovipositor 9—oviducts 10—egg-directing process of eighth sternite 11 and 12—seventh and eighth stern tes 13 14 15 and 16—seven h tenth tergites

The reproductive organs of the female (Figure 25) consist of a pair of ovaries paired oviducts, an unpaired oviduct and spermatheca The location of the unpaired parts of the reproductive organs at the tip of the abdomen is shown in Figure 26 The egg tubes or follicles which form the ovaries are of a panoistic type, common to Orthoptera, i e , they are subdivided into a number of contiguous egg chambers The unpaired ovi
23 duct opens on the ventral wall of the genital cavity, which is situated under the base of the ventral valves of the ovipositor and above the posterior part of the eighth sternite The spermatheca usually resembles a long tube and opens on the dorsal wall of the genital cavity opposite the genital opening

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It was established that the type of spermatheca (Figure 27) varies greatly in different groups of locusts and grasshoppers (the varying number of blind appendages, their shape, etc.) a fact that may be used in solving taxonomic problems. True accessory glands are apparently absent in locusts and grasshoppers. The role of these glands is fulfilled by a pair of long, blind tubular structures, each one situated at the top of each paired oviduct, behind the point where the ovaries are attached. The secretion of these apical tubular glands accompanies the egg when the latter leaves the oviduct and is used for building the walls of the ootheca. In addition, the presence of usually colored, paired, follicular glands on the sides of the genital cavity is characteristic of almost all Catantopinae. These glands are absent in the subfamilies Acridinae, Oedipodinae, and Pyrgomorphinae, an undoubtedly interesting fact for the understanding of the systematic interrelations of the above-mentioned subfamilies.

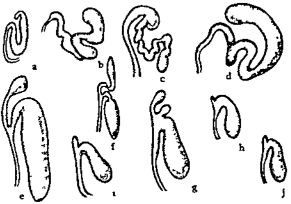

Figure 27 a-j. Spermathecae of various grasshoppers. (According to Slifer)

a—Chrotogonus sp. (subfamily Pyrgomorphinae), b—Eremopeza cinerascens (Stål.), c—Thrinchus sp., d—Haplotropis brunneriana Sauss. (subfamily Pamphaginae), e—Euchorthippus pulvinatus (F.-W.), f—Gomphocerus sibiricus (L.), g—Arcyptera fusca (Pall.) (subfamily Acridinae), h—Oedipoda coerulescens (L.), i—Angaracris barabensis (Pall.), j—Acrotylus insubricus (Scop.) (subfamily Oedipodinae).

The above-described features of the genital apparatus, in particular the structure of the male's copulatory apparatus, the epiphallus, and the spermatheca, as well as the presence or absence of follicular glands in the females may be of considerable importance in the solution of problems of taxonomy and in identification of locusts and grasshoppers. Some of these structures (the copulatory organ of the male) were used for the identification of individual species and genera for the first time by Tarbinskii as early as 1925, and were subsequently used by other authors. An attempt has lately

24 been made by *Roberts (1941) to use the morphology of the genital apparatus* for the systematics of higher groups (subfamilies) of the family Acrididae. The above author, however, ignored the complex of morphological features of the groups examined, overestimated the importance of the genital apparatus, and arrived at erroneous conclusions. For other papers on the morphology of the genital apparatus see Boldyrev, 1929, Uvarov, 1927b, Snodgrass, 1935, 1937, for a review of new data on the anatomy of locusts and grasshoppers: Uvarov, 1948.

In conclusion it must be pointed out that the terms used in morphological description, namely "length", "width", "base", "apex", "anterior", and "posterior" always have a strictly definite meaning. The length of an organ, or of some other structure, except in cases understandable without this reservation, is always considered in relation to the longitudinal axis of the body—the width—across it. The term "base" means the end which is the nearest to the center of the body, the "apex"—the end furthest from the center of the body. "anterior"—towards the head end of the body, "posterior"—towards the caudal end of the body. The length of the body is always measured from the part of the head projecting furthest forward to the tip of the abdomen. *Sometimes the term "all the length" is used, i.e., the* length of the body from the forward-projecting part of the head to the apex of the folded flight organs, in those Tetrigidae which have under-developed wings—to the hind end of the process of the pronotum. The length of the pronotum is measured only along its median carina. The length of tegmina is measured from the convex tubercle at their base (the thickened base of Sc and R) to their apical end.

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BIOLOGY

Feeding Habits. The intensity with which larvae and adults feed is not uniform throughout their life. Immediately after hatching, first instar larvae have *in their intestines the residues of embryonic yolk, and they begin* feeding actively only after having digested and excreted it. An important feature, established by Valova in 1924 and also by other authors, is the change in feeding intensity in connection with molting. There is a weakening during the pre-molting period, a complete interruption during molting, and a gradual return to normal after the molt. As a result, the total duration of fasting takes up to 15% of the entire developmental period.

The intensity of feeding of locusts and grasshoppers also varies with metereological factors, especially with intensity of solar radiation. In the southern parts of the U.S.S.R. (the southern steppes and deserts) two periods of intensive feeding are usually observed during hot weather, when the body of the insects is heated by sunrays—the morning period and the evening period. According to data by Strel'nikov (1935), the larvae of Locusta migratoria L. begin to feed when their body temperature is about 25-30° C. Feeding continues in the morning hours until the body temperature reaches 30-38° and in the evening hours when it decreases to 19-20°. From the data, the role of body temperature of locusts and grasshoppers becomes evident as one of the factors determining the

intensity of their feeding. As body temperature depends on intensity of solar radiation, feeding of these insects is also affected by cloudiness and other factors which affect the strength of solar radiation.

As to feeding habits, grasshoppers and locusts are typical plant-eating polyphagous insects, i.e., they feed on various plants belonging to different botanical families. A distinct preference for a particular plant species is, however, observed in a number of species, as well as variations in the range of consumed and preferred plants during the postembryonic development. It is known that Calliptamus italicus L. eats Compositae, Papilionaceae, Malvaceae and others more readily than Gramineae, while Locusta migratoria L. has a distinct preference for Gramineae, eating mainly reeds and cultivated plants such as cereals. The range of plants consumed is most limited in the initial instars, and a shortage of these particular plants causes an increased mortality rate.

The range of food-plants widens with the growth and development of the larvae, and in a number of cases becomes most varied when these reach the adult stage. Eirenephilus longipennis Shir. can serve as an example; in the larval stage it feeds on herbaceous plants in general and on Petasites of the family Compositae, in particular, while its adults live and feed on trees and shrubs, e.g., on the willow, eating their leaves. No injury to cereal and vegetable plants has been recorded. According to available data, certain grasshopper species are monophagous insects, e.g., Dericorys tibialis Pall., which feeds on Anabasis aphylla, and
26 the closest relative of the above grasshopper, Dericorys annulatus roseipennis Redt., which lives and feeds on haloxylon, an arborescent representative of the Salsoleae. It must be noted that the feeding habits of grasshoppers have not yet been studied sufficiently, neither in natural conditions nor experimentally. In this connection, the recent paper by Kozhanchikov (1950), based on experimental data, as well as the paper by Rubtsov (1932a), based on experiments with a complex of species under natural conditions, are of special interest.

Development. Like all Orthoptera, locusts and grasshoppers have an incomplete metamorphosis and develop according to the following schedule: egg, larva, and adult. The annual life-cycle of the majority of our [U.S.S.R.] species is similar in fundamental characteristics (Figure 31). These species have one generation a year and overwinter in the egg stage, hatching of larvae taking place in spring. In summer or at the end of spring the larvae complete their development and change into adults which start pairing after a period of time, oviposit, and subsequently die. This description of the annual cycle is, however, only a general outline, as the dates of appearance and development of individual stages do not always coincide in different species, and may vary even in one and the same species because of environmental factors.

Grasshopper eggs are shaped like elongated, more or less bent cylinders with rounded ends, the length varying from 3 to 10 mm and the width from 0.5 to 1.8 mm in different species. The lower end of the egg is usually more pointed and has numerous minute openings (micropyles). In Tetrigidae the upper end of the egg bears a long thin process—a typical feature of this family.

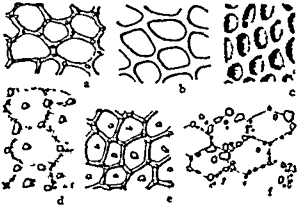

Figure 28 a-f. Sculpture of egg's chorion in various grasshoppers (According to Zimin)

a—Calliptamus italicus (L.) (subfamily Catantopinae), b—Asiotmethis muricatus (Pall.) (subfamily Pamphaginae) c—Chorthippus longicornis Latr.) (subfamily Acridinae) d—Epacromius coerulipes (Ivan.) e—Oedaleus decorus (Germ.) f—Angaracris barabensis (Pall.) (subfamily Oedipodinae).

Besides the inner covering—the vitelline membrane, the egg has an
27 outer chitinous covering—the chorion. The latter may either be smooth or may have a more or less distinctive and specific marking. According to Zimin (1938), two types of sculpture are distinguishable· one devoid of processes and bulges on the chorion, but with depressions and elevations of the chorion plate itself, under the microscope this cannot be seen in "bright-field illumination", becoming distinct only in "dark-field illumination" (subfamily Acridinae and certain Pamphaginae). The other type is characterized by ridges and tubercles, which can be seen in "bright-field illumination", provided the slide is properly treated (subfamily Oedipodinae, many Catantopinae, and others, Figure 28). A protected egg-mass, the so-called egg-pod [ootheca], is typical of grasshoppers (Figure 29). Most grasshopper species deposit their eggs in the upper layer of the soil, and their ootheca therefore have earthen walls or are covered with soil from above. The ovipositing female inserts her ovipositor into the soil and releases a portion of eggs suspended in a foamy liquid secreted by the accessory glands at the tip of the abdomen. A group of eggs is left in the surface layer of the soil after oviposition, these eggs being entirely or partly enveloped in the solidified secretions of the accessory glands. Earth particles surrounding the egg-mass are often cemented with these secretions, as a result of which the pod acquires strong, hard earthen walls (Arcyptera Serv., Ramburiella Bol., certain Dociostaurus Fieb., and others). However, the walls of the pod often may be membranous or foamy and covered with earth only from above. Therefore in this particular case the walls of the pod are formed only by the solidified secretions of the accessory glands covering the egg-mass (Locusta migratoria L., Oedipoda

Latr., some Chorthippus Fieb., and others). A fine-meshed foamy mass, in many cases yellowish or rosy in color, is often present between the eggs inside the pod.

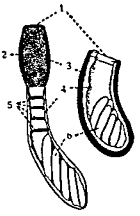

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Figure 29. Sketch of structure of grasshopper ootheca from the example of Dociostaurus brevicollis (Ev.) (left) and D. kraussi (Ing.) (right). (According to Zimin.)

1—lid 2—foamy mass, 3—earthen walls, 4—membranous walls, 5—membranous divisions, 6—eggs.

Thus the egg-pod of grasshoppers consists of the eggs, the foamy mass between them, and the outer walls. However, in a number of species, it is of a more complicated structure, due to additional elements, e.g., a lid which covers it from above (Gomphocerus sibiricus L., Dociostaurus Fieb., Arcyptera Serv., Ramburiella Bol., and others); or a membranous inner lining of the walls (Pararcyptera microptera F.-W., Dociostaurus Fieb., and others); and transverse partitions in the form of thin films above the egg-mass (Dociostaurus brevicollis Ev.). In some cases the egg-pod is devoid of certain basic features, e.g., the foamy mass (Pararcyptera microptera F.-W. and Ramburiella turcomana F.-W.), or it has the foamy mass, but no distinct walls (Schistocerca gregaria Fŏrsk.); it may be devoid of all these features, including the walls, and appear as a simple mass of eggs (certain species of the genus Tetrix Latr.).

Certain grasshoppers deposit their eggs in the layer of plant residues covering the soil (Chorthippus macrocerus F.-W.), onto plants, or they may even insert them inside stems. Thus Euthystria brachyptera Ocsk. places the egg-pod between leaves near plant roots or in fallen leaves. Its relative Chysochraon dispar Germ. inserts the eggs into plant stems, while many Stenobothrus Fisch. use their own excrement, consisting of undigested plant particles, for the construction of the pod walls, placing the pod between plants. Certain representatives of the family Tetrigidae deposit their eggs in moss and lichens.

The data affirm the wide diversity of oviposition and types of egg-pods in grasshoppers. This fact reflects a wide range of adaptations to different conditions.

The egg stage, i.e., the major part of the annual cycle, lasts 8-10 months, therefore this long and important period can be successfully completed only with suitable adaptations, which protect the eggs. The nature of these adaptations is as yet unclear in many species, though even the length of the pod may be of an adaptive character. The longest egg-pod is peculiar to species inhabiting deserts. Owing to this feature, the egg-mass itself is buried in the soil and protected from high temperatures, thus enabling these species to overcome the harsh environmental conditions typical of deserts. Therefore the structure of the egg-pod, as well as the shape of the eggs, are specific characters and may serve not only as reliable

identification criteria for definition and description of individual species, but also for systematic and classification purposes in general. Identification features of egg-pods in locust and grasshopper pests have been utilized for a long time in the practice of locust and grasshopper control in the U.S S.R., i.e., in estimating the reserves of the pest, according to egg-pod deposits. Similarly, certain systematic problems were correctly solved by the study of grasshopper egg-pods. For more details on locust and grasshopper pods see paper by Zimin (1938); certain new data can be found in the paper by Valova (1950).

Oviposition usually starts in the middle or end of summer, but certain species which acquire wings at the end of spring or beginning of summer, start ovipositing as early as the beginning or middle of June (*Dociostaurus maroccanus*). *Locusta migratoria* L. begins ovipositing later than many other species, in the northern Caucasus and Middle Asia it usually takes place not earlier than August, and often only in September. A single female usually deposits 1, 2, or 3 egg-pods, but under favorable conditions and with abundant food the number of deposited egg-pods may increase. There are recorded cases of a single female laying 14 and even 22 egg-pods under artificial rearing conditions, but these data are not correct for natural conditions.

The development of the embryo starts immediately after oviposition, but in the majority of species in the U.S.S.R. the development is interrupted,
29 even prior to the onset of cold weather, and is resumed in spring, after overwintering, the embryonic diapause is therefore peculiar to these species. The initial developmental period of the embryo ends in the formation of external features (segmentation of the body and formation of the appendages of the head and the thorax) while the cephalic part of the embryo is still at the lower (micropylar) pole of the egg, and the diapause begins. After overwintering, the diapause of the egg-pods ends and the embryo, in the process of further development, increases in size and changes its position inside the egg, the head shifting to the upper pole of the egg and the embryo becoming ready for hatching.

As shown by research, low temperature, as low as freezing, is necessary to end the diapause in a number of locusts and grasshoppers of the U.S.S R. The embryonic diapause prevents grasshoppers of moderate latitudes from hatching in the fall, i.e., prior to the start of winter, and thus they avoid overwintering in larval or adult stages. Thus there is an adaptation of locusts and grasshoppers of the U.S S R. to moderate climatic conditions, it allows these species to spend the winter period in the egg stage, which is less dependent on environmental factors than the active stages, which require food, heat, and other environmental conditions.

A description of the features of embryonic development is given in papers by Shumakov and Yakhimovich (1950) and Yakhimovich (1950) as observed in *Locusta migratoria* L. Research by the above authors shows that distinct changes in the environmental requirements of individual stages of the developing egg occur during the embryonic period. The initial (fall) period of embryonic development is characterized by the need of relatively high temperatures (25-30° C optimum) and moderate moisture. Later, lower temperatures are required for ending the diapause, while the concluding (spring) period of embryonic development is distinguished by the need of high temperatures (as in the initial period) and an excessive contact moisture.

Analogous data on several Siberian grasshoppers are given by Vinokurov (1949a). Undoubtedly, these features of embryonic development are a reflection of stage processes, in the sense of Lysenko's Theory of Stages and further research in this direction may help to arrive at valuable scientific results.

The Larva. The necessity of penetrating the layer of soil or other substrates separating the egg from the surface of the soil arises when the larvae hatch in spring. The hatched larva, which has not yet reached the surface, is of a vermiform appearance and has a special temporary organ, the pulsating cervical ampulla. Such a larva is called vermiform. With the help of worm-like movements and the cervical ampulla, which enables it to push aside the soil particles, the larva emerges at the surface and immediately casts its skin. As a result of molting it loses the cervical ampulla and its vermiform appearance, and changes into a true first instar larva. This molt is called the intermediate molt, to distinguish it from subsequent ones.

Among earliest-hatching species are mainly the desert dwellers, while the late-hatching species are inhabitants of damp places, i.e., water-
30 meadows and marshes. Dociostaurus maroccanus Thunb. is a striking example of the first group of species. In Transcaucasus and Middle Asia it hatches during the first half of April, while in Tadzhikistan the hatching takes place sometimes even at the end of March. Locusta migratoria L. belongs to the late-hatching species. Even in Middle Asia it hatches not earlier than the beginning of May, while in a number of localities the hatching of this species may be extended to June and even to the beginning of July, depending on the dates of lowering of water where there are egg-pod deposits, and on other factors.

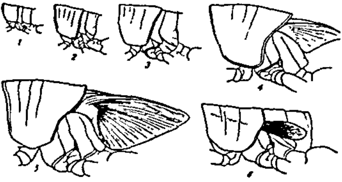

Figure 30. Development of wing rudiments in first-fifth instar larvae (1-5) and an adult brachypterous grasshopper Miramella alpina (Koll.) with lobe-like lateral tegmina (6). (Original)

Extended dates of hatching are observed in other species too, especially if the egg-pods are deposited in rugged terrain. Even in Dociostaurus maroccanus, which is characterized by a simultaneous hatching of larvae,

hatching may be extended for 1 1/2-2 weeks, depending on where the egg-pods are situated. Hatching starts earlier on southern slopes and later on northern slopes. A rather extended hatching period is observed in Calliptamus italicus L. The timely estimation of hatching dates, according to terrain factors, as well as weather conditions in the spring period, acquires considerable importance in grasshopper control.

After the intermediate molt, larval development takes 30-40 days on an average, with fluctuations depending on individual characters and climatic factors. The larva molts 4-5, sometimes 6 times (even 7 times in certain tropical species), thus having 4, 5, or 6 instars. During larval development and molting, the larva increases in size and undergoes certain fundamental changes. With each subsequent molt the number of antennal segments increases and the shape, position, and size of the wing rudiments and the terminal appendages of the abdomen change, as well as the correlation between individual parts of the body. For the majority of U. S. S. R. species, which have 5 larval instars, the difference between the instars is as follows (Figure 30)

31 First instar. Wing rudiments absent or hardly perceptible as slightly produced postero-ventral angles of the metanotum. The antennae usually have not more than 13 segments.

Second instar. Wing rudiments distinctly perceptible in the shape of produced ventrad and caudad postero-ventral angles of the meso-, and especially the metanotum, but the veins are weak and isolated. Antennae with 15-17, sometimes 18-19 segments.

Third instar. Wing rudiments very easily perceptible, still situated on the sides of the body, but more strongly produced than in the preceeding instars and with numerous veins. Antennae with 17-22 segments.

Fourth instar. Wing rudiments situated on the dorsum in the shape of small triangular lobes, which are usually shorter than the pronotum. The inner pair (rudiments of the tegmina) are narrower and shorter than the outer pair. Antennae with 21-25 segments.

Fifth instar. Wing rudiments the same length as, or longer than the pronotum, the inner pair (rudiments of tegmina) not shorter than the outer pair (rudiments of wings). Antennae with 23-26 segments.

In some cases where there are only 4 instars (Gomphocerus sibiricus, Stauroderus scalaris, Chorthippus albomarginatus Deg. and others) the above outline of differences between the instars remains the same, but the features of the second and third instars are united into an aggregate second instar, and consequently the fourth and the fifth instars become the third and the fourth respectively. For more details of larvae see Dovnar-Zapol'skii (1924, 1926, and 1940), Bei-Bienko (1928a), and Rubtsov (1932c).

The Adult Stage. With the final molt the larva changes into an adult insect. Immediately after this molt, the wings are wrinkled and abbreviated, but later they develop rapidly and acquire their normal shape.

Research has shown that the mass of the grasshopper's body is doubled with each subsequent molt, hence, the linear dimensions increase by $\sqrt[3]{2}$, i e , 1.26 times (Shpet, 1939) However, it is evident that the adduced coefficients of growth are only rough ones and may undergo fundamental changes under the effect of environmental factors. In spite of this, the

above-mentioned regular patterns of growth may be important for understanding of the fact, established by Plotnikov (1931), that the area occupied by larval bands increases considerably with each subsequent molt (instar), the increase being greater as the larva grows. This phenomenon is of considerable importance for the scientific organization of grasshopper control and the proper planning of dates for the application of control measures.

Sexual maturity. An adult grasshopper does not become sexually mature and capable of reproduction immediately after the final molt, as some time is required for maturation of the genital glands. In some species sexual maturity occurs soon after the acquirement of wings (in 3-7 days), in others, only after several months. Sexual maturity in certain species is accompanied by a change in the coloration of the body, or its individual parts. *Schistocerca gregaria* can serve as a striking example, sexually immature specimens have a rosy wine coloration, while entirely mature ones are characterized by a lemon-yellow coloration of their bodies. Changes in the coloration of individual parts of the body, i.e., hind legs and wings, are observed in other species. Thus, *Chorthippus jacobsoni* Ikonn., native to the Trans-Ili Ala Tau, has underdeveloped ovaries or testes
32 during the first days after the acquirement of wings, and is characterized by yellow hind tibias. The male does not stridulate during this period, but soon, by the time the genital glands mature, the tibias acquire a red coloration and the male starts chirping actively.

The change in the coloration of hind wings during the adult life of specimens has been described for 2 African grasshopper species: *Nomadacris septemfasciata* Serv. and *Mesopsis laticornis* Kr. The former acquires its wings at the end of the rainy season and remains sexually immature during the subsequent dry period, the wings being colorless. It becomes sexually mature with the beginning of the next rainy season and the wings acquire a bright rosy coloration. *Mesopsis laticornis* also has colorless wings in the beginning, which coincides with the dry period, while sexual maturity comes with the subsequent rainy period and all the specimens acquire a large dark spot at the base of the wings. The appearance of specimens with a light yellowish tinge of the wing's membrane and a small dark spot at the base of the wing can be considered an intermediate stage (Burtt and Uvarov, 1944). Less distinct changes in the coloration of the body during the adult life of alate species have also been recorded in a number of other grasshoppers, and an insignificant general yellowing of the body has been observed in older specimens of *Locusta migratoria* L. and *Dociostaurus maroccanus*.

It must be noted that the evaluation of the physiological causes of coloration changes in grasshoppers is not unanimous among different authors. A number of authors connect these changes with sexual maturation of individuals, others oppose the above theory and consider the coloration changes to be an index of age changes in ageing alate individuals (Boldyrev, 1946). There can be no doubt that coloration changes sometimes coincide with one or another state of the genital system, and *Schistocerca gregaria* can serve as a striking example.

The adduced data testify that the development of locust and grasshoppers is not completed with the acquirement of wings. Physiological processes connected with ageing of the organism and the accumulation of metabolic products are reflected in the color changes of the body and in the behavior

of individuals, and are worth detailed study, which may have theoretical as well as practical importance. At the same time, these data indicate that a cautious and critical attitude is necessary in the utilization of color features for identification

The period of sexual maturity is characterized by increased activity of the male and its intensified stridulation. Chirping sounds are made by various methods. In the majority of cases stridulation is produced by the friction of certain longitudinal veins of the tegmina against the inner side of the hind femurs, and minute tubercles or notches are often present on one of the organs taking part in the friction. In locusts and grasshoppers of the subfamily Acridinae these tubercles are situated on the inner side of the femur where they form a regular row. The sound is produced as a result of movement of the hind femurs and friction of the tubercles against the radial vein (R) of the tegmina. In the majority of species of the subfamily Oedipodinae the false median vein, which is often notched, takes part in the friction, while the inner side of the hind femurs is always devoid of notches or tubercles. However, in the genus Vosseleriana Uv. the stridulation function has passed from the false median vein to the true median vein (M), which bears convex tubercles

33 In representatives of the subfamily Pamphaginae, stridulation is produced by an entirely different method. The male middle femurs have a notched dorsal side, this is rubbed against a thickened anal vein ($2A_2$) of the unfolded wings, mainly at the end of the flight. Many previous authors believed that Krause's organ (a rough plate on the sides of the second abdominal segment) takes part, but this opinion is disputed by certain contemporary authors. Nevertheless, both male and female Asiotmethis Uv. can produce a sound, which, though not shrill, is well audible and resembles rustling or weak hissing, by rubbing the bases of the suitably placed femora against the afore mentioned plate They do this when they are caught and attempt to free themselves from man's hands It is quite possible that in such a manner these insects, which are clumsy, and do not fly well, can get rid of threatening insectivorous animals.

Stridulation in the representatives of the genus Charora Sauss. (subfamily Egnatiinae) is done in a rather peculiar manner. The males have *special areas, bearing vertical rugulae, on the sides of the fourth to eighth* abdominal tergites, while the inner spines of the hind tibias are flattened and have pointed margins A sound can be produced by scratching these spines against the above areas No data, however, are available on stridulation of these species under natural conditions.

Besides the described ways of stridulation, there are other ways, typical of other species of locusts and grasshoppers, in particular Indian Mesambria Stål and Californian Oedaleonotus fuscipes Sc (both of the subfamily Catantopinae) and others produce sounds by moving their mandibles

Certain locust and grasshopper species are capable of producing sounds during their flight, the following serving as striking examples Bryodema Fieb., Angaracris B.-Bienko, Psophus stridulus L., Sphingonotus obscuratus Walk , Sphingonotus savignyi Sauss , species of the genus Helioscirtus Sauss , Hyalorrhipis Sauss., and others A number of the enumerated species can chirp only when they are flying, but certain species are capable of chirping while sitting on plants or on the ground, e g., Stauroderus scalaris F.-W. and Sph savignyi

Sauss. However, the manner of chirping of an insect while flying is entirely different from that of a stationary insect. In the first case the sound is produced by the hind wings, which have thickened veins (the thickness of these veins varying in different species), and in the second case by friction of hind femurs against corresponding veins of the tegmina.

Many species are, however, unable to stridulate, this probably being particularly typical of a number of Catantopinae, although they have hearing organs, and of the representatives of the families Eumastacidae and Tetrigidae, which are characterized by the absence of hearing organs on the first abdominal segment.

Spermatophorous Fertilization. Ripening of eggs and oviposition are preceeded by pairing and fertilization. Spermatophorous fertilization is typical of grasshoppers, as of all Orthopterous insects. The process of pairing and the formation of spermatophores has been described by a number of authors, but research by Boldyrev (1929) is of special interest, as this author has revealed the functional importance of individual parts of the genital apparatus in the process of pairing, and has established three types of spermatophorous fertilization in grasshoppers.

Pairing begins with the crawling or jumping of the male on the female, and bending of the end of the male's abdomen under that of the female. In the process of pairing the male's cerci serve as orientation organs for the
34 end of the male's abdomen and fix the latter by becoming attached to the base of the female's genital plate. The female's genital plate is bent ventrad with the help of the anterior, hook-like processes of the epiphallus, and the penis is inserted between the bases of the ventral valves of the ovipositor into the receptaculum seminis. The ejection of spermatophores from the terminal portion of the penis then begins. A spermatophore is a typical hyaline transparent formation and has the shape of a bladder-like vessel with a long exhalent tubular part, or the shape of a rounded cylinder. It contains spermatozoa aggregated into groups (spermatodesmae), as well as accessory bodies, which appear as a concentration of corpuscles, transparent lumps, or irregularly oval bodies. The walls of the spermatophores, as well as the accessory bodies, are products of the secretion of the male's accessory sexual glands. Pairing lasts for several hours (sometimes up to 20), its duration depending on thermal factors. Twelve hours after oviposition pairing can be repeated.

According to Boldyrev (1929), 3 types of spermatophorous fertilization are observed:

1) The spermatophore has the shape of a rounded cylinder, devoid of an elongated exhalent tube. Pairing lasts a short period of time, the entire spermatophore being introduced into the spermatheca and emptied of semen without the participation of the genital apparatus of the male. The empty spermatophore is ejected through the genital opening of the female 2-4 days after pairing. This type is typical of the family Tetrigidae.

2) The spermatophore consists of a bladder-like membranous vessel and a tubular exhalent portion. The process of pairing takes more time. Several spermatophores are introduced into the spermatheca—only their tubular part—one after another, and promptly emptied. The empty spermatophores are ejected as turbid yellowish lumps, which are piled up between the ventral valves of the ovipositor (the "sign of fertilization"). After the pair parts, the empty spermatophores fall off. This type is typical of the subfamily Catantopinae of the family Acrididae.

3) The spermatophore resembles the preceding one, only the tubular part of a single spermatophore being introduced into the spermatheca, with the vessel of the spermatophore remaining in the ejaculatory duct of the male and gradually being compressed to release the semen. The spermatophore tightly binds the pair in the process of prolonged copulation, and the end of copulation is accompanied by the rupture of the spermatophore, its tubular part being left in the female's spermatheca, while the vessel remains for a short time in the male's penis, before emerging. The tubular portion of the spermatophore is preserved together with the semen in the spermatheca for a long time (sometimes 5-6 weeks) and is emptied of semen only after ripening, while the remainder of the spermatophore is ejected. This type is typical of the subfamilies Acridinae and Oedipodinae of the family Acrididae.

Thus, as the subdivision of locusts and grasshoppers into individual families and subfamilies is reflected in the characteristics of spermatophorous fertilization, the study of this phenomenon is of importance not only for understanding the biology of multiplication, but also for general classification of the whole group

Annual Cycle. After pairing, and oviposition by the females, the individuals die and the cycle of development is thus completed. Overwintering in the egg stage, hatching of larvae in spring, appearance of adult specimens in summer, oviposition and dying in summer or fall is typical of the majority of locusts and grasshoppers in the U.S.S.R. (Figure 31). There is, however, a number of species which overwinter in active stages, as larvae or as adults, all these species either being arrivals from tropical or subtropical countries or representatives of genera of a distinctly tropical origin. To these belong all the representatives of the family Tetrigidae *Schistocerca gregaria* Fôrsk., *Anacridium aegyptium* L and *Acrotylus insubricus* Scop, many representatives of the subfamily Acridinae (*Acrida* L, *Truxalis* Fabr., *Duroniella* Bol., *Ochrilidia* Stål), the genera *Aiolopus* Fieb. (subfamily Oedipodinae), *Pyrgomorpha* Serv., and *Chrotogonus* Serv. (both of the subfamily Pyrgomorphinae), *Tropidauchen* Sauss., *Nocaracris* Uv., and others (subfamily Pamphaginae). All the above grasshoppers overwinter either as adults or as larvae, overwintering in the adult stage prevailing in certain species, and in the larval stage in others

It should be noted that 2-3 generations per year are possible for certain species of this group. In particular it is known for *Schistocerca gregaria* Fôrsk. and there are indications for *Tetrix vitata* Zett., which is found in Central Europe. The presence of an imaginal diapause, connected with the dry period of the year, has been recorded for many locusts and grasshoppers of tropical and subtropical zones As a result of this phenomenon the adult specimens, which appear at the beginning of the dry period, remain sexually immature for a long time (up to 10 months in *Patanga succincta* Johan from India and southeastern Asia) and mature only at the beginning of the rainy season

In a number of cases, hatching of the larvae is also retarded because of insufficient moisture, and takes place only after the rains. This is typical of a number of tropical and subtropical species, e.g., *Schistocerca gregaria* Fôrsk, African *Nomadacris septemfasciata* Serv. (see page 30), South African *Locustana paradalina* Walk, and

The solitary phase is the usual state of gregarious species, and is generally more widely distributed than the gregarious phase. The formation of the gregarious phase takes place as a result of an increase in numbers of locusts and a subsequent forced concentration of larval or adult specimens within a limited area. This concentration takes place as a result of a temporary change in the living conditions of locusts in special areas, the breeding foci, which are characterized by a variability of environmental factors. Insufficient moisture in these foci leads to an uneven drying up of vegetation in areas of habitation of the solitary form, and these larvae begin to concentrate in places where a rich green vegetation is preserved
38 (lowlands, ravines, etc.). A similar concentration of certain species can take place under the opposite conditions, i.e., when an increase in the amount of moisture in the foci leads to the development of a dense plant cover, but the concentration of locusts takes place in areas with sparse vegetation (elevated points, hillocks, etc.).

The concentrated grasshopper specimens come into mutual contact by means of sight, tactile, and olfactory organs. The constant interaction turns congestion into a usual state for these specimens, and leads to the appearance of the conditioned gregarious reflex, whereby the specimens do not disperse, but live in congestion, and move in dense bands or swarms despite attempts to disperse them by force.

The congested, or gregarious way of life also changes the physiological features of locust specimens. An increased excitability of the nervous system results in more energetic movements and a higher metabolic rate. The metabolic products are partly deposited on the skin cuticle as black and rust-colored pigments, thus giving the typical coloration of the gregarious phase. The intensified movements of individual organs create conditions for a change in the proportions and structure of individual parts of the body. The features of the gregarious phase become more pronounced due to the accumulation of pigments on the skin which contribute to an intensified absorption of solar radiation resulting in an increase of body temperature and excitability. This leads to the appearance of the gregarious phase with its morphological and physiological features.

The transition of the solitary phase from the gregarious phase is a consequence of a forced thinning out of swarms, i.e., a destruction of a considerable part of the specimens through control measures or the death of the majority of specimens due to the effect of unfavorable environmental conditions (see the chapter "Ecology"). A decrease in the number of specimens per unit area can make the mutual contact difficult, or ends it. As a result, the conditioned gregarious reflex is lost, and the specimens resume a solitary life.

The gregarious phenomenon in locusts and grasshoppers is undoubtedly of an adaptive character (Shumakov, 1940), as it ensures a higher body temperature, weakens the heat loss, and contributes to a higher metabolic rate. Thus, the interactions between specimens of the gregarious phase become a typical and indispensible condition for their existence in a swarm or a band, and the loss of these interactions leads to the formation of the solitary phase, which is devoid of a number of features useful for the species.

All the above-mentioned facts indicate that the phase in locusts and grasshoppers is a specific form of existence of a species under definite environmental conditions. No scientific foundation exists for considering the gregarious and solitary phases as independent or evolving species.

Gregariousness in locusts and grasshoppers has lately been connected with the presence of a special instinct (Zakharov, 1946a, 1950) which appeared during previous geological ages under special, more favorable environmental conditions (warm and humid climate) This instinct has been fully preserved up till our time in Locusta migratoria only, while in other locusts and grasshoppers it became weakened to a greater (solitary grasshoppers) or lesser (Dociostaurus maroccanus and Callipta-
39 mus italicus) extent. A simple increase in locust numbers in wide areas with suitable feeding plants concentrated in huge tracts, where feeding conditions are especially favorable, is considered by the above author a basic condition for the transition from the solitary to the gregarious phase.

The above opinion does not elucidate the factors causing the formation of the gregarious phase under natural conditions, but gives an hypothesis explaining gregariousness as a special instinct which appeared during preceeding geological ages under the effect of certain, especially favorable conditions If we accept this hypothesis as a basis, it becomes difficult to understand why solitary species make up the overwhelming majority of locusts and grasshoppers (up to 10,000 species all over the world), while the gregarious ones are represented by only a handful of species. It is difficult to assume that only these few gregarious species live under conditions more favorable than those of the solitary species. Gregariousness can also not be accepted as an initial state, because available data lead to the opinion that gregariousness is a secondary phenomenon of an adaptive character Finally, it is not clear how favorable feeding conditions can, over a vast territory, facilitate the transition from the solitary phase to the gregarious

The theoretical foundation of the phenomenon of phases has a direct relation to the understanding of the role of locusts as pests of agricultural crops and to the organization of proper control measures A study of specific conditions and localities where the transition from the solitary to the gregarious phase is possible, will contribute to the eradication of the gregarious phase by means of agricultural and chemical measures This will result in the end of mass flights and will prevent the infestation of new territories, thus eliminating the menace to agriculture. The above measures are applied on a large scale in the U.S S R , and have already given appreciable results, although a great deal remains to be done in order to achieve the best possible results.

A brief review of information on phases was given by us (Bei-Bienko, 1937), but since then a number of new facts have appeared As the literature on the above problem is voluminous and scattered, only a few sources are given below Uvarov, 1921c, 1927b Plotnikov, 1927, Predtechenskii, 1928a, Tarbinskii, 1932, Faure, 1932, Rubtsov, 1935c, Husain and Mathur, 1936, Kennedy, 1939, Shumakov, 1940, Vasil'ev, 1950b A critical review was recently published by Key, 1950

ECOLOGY

The Organism and its Environment. Like all other organisms, locusts and grasshoppers are an integral part of their environment, and, therefore,

every species is closely connected with definite external conditions of existence, i.e., with a complex of environmental, or ecological factors. The latter constantly operate on locusts and grasshoppers during the contemporary period, as they did in past geological ages. Thus the numbers and distribution of every grasshopper or locust species are a result of the prolonged effect of ecological factors, which are also reflected in the morphological and physiological features of every species.

Besides the natural ecological factors outlined above, a new factor acquires an ever increasing importance during the contemporary period, namely, man, who, in the process of his economic activity, changes nature, and thus affects the life of organisms.

The various environmental factors can be grouped under four headings, namely, abiotic factors (the effect of climatic factors and the water-schedule of rivers), edaphic factors, biotic factors (the influence of living organisms through feeding and other interrelations), and anthropic factors (the effect of the various activities of man). This ecological classification is only the first step in understanding the interrelations of an organism with its environment, and does not reveal the nature of these interrelations. Michurin's modern biology teaches that environmental factors are not uniform in their effect on the organism, some of them being indispensable conditions for the existence of the organism (food, heat, moisture, light, etc.), while others are not indispensable for the organism but affect it (parasites and predators, causative agents of diseases, various other organisms, certain biotic factors, etc.).

The theory of the unity of the organism and its environment represents the second important tenet. This unity is revealed in the fact that the organism, in accordance with its hereditary characters, assimilates the conditions necessary for its existence, and becomes adjusted to them. A change in environmental conditions leads to a change in the number of individuals and can be conducive to the appearance of new species which require different environmental conditions in the process of phylogenesis. Certain factors may, during the process of the formation of new species, become indispensable conditions for their existence and vice versa.

A change in the number of insects in a species is the initial and immediate result of environmental factors, and is realized in time, as well as in space. The mass multiplication of injurious species (*Locusta migratoria*, *Dociostaurus maroccanus*, various solitary grasshoppers, etc.) observed during certain years, is an indication of the change of grasshopper numbers in time, while a change in limits of distribution is an indication of the change of numbers in space. Fluctuations in the number belonging to a species are also affected by the activity of man. Striking examples of this effect are presented by the complete disappearance of *Dociostaurus maroccanus* in certain localities—in the Ciscaucasus and partly in Middle Asia and the Transcaucasus—due to the effect of plowing virgin lands, as well as by the decrease in numbers of locust and grasshopper pests in a number of regions in Siberia, the Ural Region, and the southeastern part of the European part of the U.S.S.R. due to the effect of better farming methods, grassland crop rotation, field-protecting afforestation, etc.

Habitation Areas of Locusts and Grasshoppers. The great variety of environmental factors cannot be considered to operate on all locusts and grasshoppers, these factors being accepted by each species individually, in

accordance with its specific requirements and ability to assimilate them. This ability represents the unique character of each species and is confirmed by the fact, long established in the Soviet literature, that each species is not found beyond its definite habitat, and different habitats are characterized by different species Thus *Mecostethus grossus* L is
41 never found beyond sedge swamps, a number of grasshopper species live only in hilly sands in the desert zone (certain representatives of the genera *Ochrilidia* Stål, *Thrinchus* F -W , *Diexis* Zub., species of the genus *Hyalorrhipis* Sauss., and others), certain species are a reliable sign of saline soils (e.g., 3 species of *Sphingonotus*, namely, *S. salinus* Pall., *S. halophilus* B.-Bienko, and *S. halocnemi* Uv.), while others are typical of feather-grass steppes (e.g , *Euchorthippus pulvinatus* F.-W.), and so on

The opposite features are typical of certain species found in various places; these have a great tolerance for varying environmental factors, e.g , *Calliptamus italicus* L and *Chorthippus brunneus* Thunb , but even these species have a definite range of preferred habitats. Although the majority of species can occur in several different habitats, it is often possible to establish, by means of exact quantitative estimation, that there are a number of species preferring one particular habitat where they are most numerous.

The data show that specific ecological features of a particular grasshopper species influence its choice of habitat The type of habitat of each individual species is typical and easily observed, and indicative of different characteristics of the species, i e , its requirements as to abiotic, edaphic, and biotic environmental conditions These ecological features of species are concealed, but exist, and are essential specific features, similar to outwardly expressed morphological features Hence, the complete characterization of a species cannot be limited only to a list of its morphological features Modern taxonomy must consider ecological (as well as biological) features of a species, and the consideration of these features can sometimes contribute to the solution of difficult problems of species identification and taxonomy Knowledge of eco-biological features of a species also enriches the description of its characteristics Research by Tarbinskii (1930) on the systematics of the genus *Calliptamus* Serv , serves as a classical example *Calliptamus italicus* L , a dangerous pest of agricultural crops, was long considered the only known representative of the above genus, but observations revealed that different individuals of this "species" reacted differently to light, an important ecological factor Some individuals were attracted by light, while others were indifferent to it The former were found to be representatives of a harmless species, *Calliptamus barbarus* Costa, while the latter were representatives of the true *Calliptamus italicus* L The above eco biological feature of these species helped in understanding their morphological differences, and, as a result, an entire complex of species, now well-distinguished morphologically and ecologically, has been revealed to be the genus *Calliptamus* The results of Tarbinskii's research immediately influenced the theory and practice of the control of locust and grasshopper pests in the U S S R

The choice of habitats by one or another species depends on their utilization of environmental conditions All grasshoppers are phytophagous insects, therefore the plant cover is one of the most important environmental

42 factors. Only a small number of grasshopper species, however, are known to have a distinctly-expressed food specialization. To these belong: Ochrilidia hebetata Uv., which lives and feeds only on a particular cereal grass; Aristida pennata, peculiar to hilly and ridgy sands of the desert zone; Dericorys annulatus roseipennis Redt., connected in the same way with a particular, large arborescent salsola—Haloxylon, independently of whether it grows on saline soil or on sands; the closest relative of the latter, Dericorys tibialis Pall., which lives on Anabasis aphylla and, probably on other salsolas; and Sphingonotus halocnemi Uv., which feeds on Halocnemum strobilaceum and, probably, on other salsolas.

The vast majority of the other grasshopper species are polyphagous insects, although a connection with representatives of Gramineae is typical of many species, and consequently plant associations with a considerable participation of cereal grasses are usually characterized by a varied species composition and high population density of grasshoppers. The plant cover acts as a biotic factor in these cases.

However, the distribution of locusts and grasshoppers according to habitats often depends to a considerable degree on the density of the plant cover. In polyphagous grasshoppers, i.e., when there is no close connection between the species and any particular plant, the above factor often becomes of decisive importance because density of the plant cover determines the degree of warming-up by sunrays of the soil's surface and the adjacent layer of air, ventilation, and relative humidity. Hence the density of the plant cover determines the microclimate of the habitat, and the plants appear in this case as a climatic rather than a biotic factor. Intensive grazing without proper agricultural measures (rotation of pastures, etc.) can strikingly illustrate the effect of density of the plant cover on the numbers and often on the composition of species of locusts and grasshoppers. Such grazing contributes to the thinning-out of the plant cover, and leads to an increase in the number of locusts and grasshoppers in the pastures. As a result, such overgrazed pastures often become foci for mass-breeding of harmful species. On the other hand, the planting of forest shelter belts in the steppe zone creates a denser grassy cover in the inter-belt spaces, and thus contributes to a decrease in locust and grasshopper numbers.

Apart from the density and height of the plant cover, the microclimate is considerably affected by the topography of the area and the presence of ground-water and reservoirs, which affect the degree of moistening of the soil and the humidity of the air layer adjacent to its surface.

At the same time, the soil cover appears as an independent ecological factor. A number of grasshopper species are not indifferent to the mechanical composition of the soil, and its chemical and physical properties. The main point of this independent effect of the soil is still not clear in a number of species, but probably the fact that the soil is used as a substrate for egg-laying by the great majority of locusts and grasshoppers, is of importance in this case.

The effect of the mechanical composition of the soil on the distribution of locusts and grasshoppers is especially strongly pronounced in species
43 connected with loose sands. These sand-dwellers are usually characterized by distinctly expressed adaptations (coloration, body structure, and especially the structure of legs) for their life in the sands. To them belong the

genera Hyalorrhipis Sauss., Chrotogonus Serv , and others which are only found on sands The rock-dwellers are a large group of species connected with a rocky substrate, and usually perfectly adapted to it in color, e g , many Pamphaginae; a number of Oedipodinae, in particular certain Sphingonotus species (Sphingonotus nebulosus F -W and others), Bryodema Fieb , and so on

The role of the chemical composition of the soil has been little studied, but it is known that certain species are closely connected with saline soils, e g , Dociostaurus kraussi Ing., representatives of the genus Epacromius Uv , certain Sphingonotus species (see page 39) The nature of this relationship has specific features in different species Thus, species of the Epacromius Uv. genus are usually connected with moistened saline soils, while corresponding Sphingonotus species are usually adapted to generally saline soils of desert zones, e g , solonchaks, takyrs, and even rocky areas, i e , they are to a certain extent not influenced by *mechanical properties of the soil*

Finally one of the physical properties of the soil, namely, the density of its surface, is of decisive importance for Dociostaurus maroccanus Thunb and certain other species Dociostaurus maroccanus lives only on compact virgin soils, plowing of the latter being a disaster for this species

Change of Habitat Zones The wide distribution of a number of grasshopper species is connected with their adaptation to environmental conditions in different zones of the geographic area of distribution These species are therefore compelled to accept the environmental conditions of two or even three adjacent zones, e g , the forest and the steppe or the steppe and the desert zones

It has been established that such species inhabit open, well-heated, and dry habitats in the north of the range, while in the southern parts of the range they live in moistened habitats with a dense plant cover, which creates an increased shading of the soil Calliptamus italicus can serve as an example It inhabits sandy habitats or the southern slopes of chalky erosions with a sparse plant cover in the central chernozem area and in the south of western Siberia, while in Middle Asia it inhabits well irrigated areas with a dense grassy vegetation meadows, sides of irrigation ditches, and old alfalfa fields, i e , sites within the limits of oases Similarly, Locusta migratoria inhabits reedy river banks and shores of lakes and seas in the southern steppe and desert zones, while living in open sandy areas when it penetrates into the European part of the U S S R to the south of the non-chernozem zone Analogous examples can be given for many other locust and grasshopper species and for a number of other insects This regular pattern is designated as the rule of zonal change of habitats (Bei-Bienko 1930b)

The above rule can be expressed graphically (Figure 36) If we group all the habitats into 3 categories, according to the degree of dampness, namely xerophyte (dry and warm sites with a sparse grass stand), mesophyte (moderately damp), and hygrophyte (very damp sites of a meadow or swamp type), species inhabiting xerophytic habitats in the north of the range
44 will shift to *mesophytic and hygrophytic habitats with their movement southward* (the displacement is shown with oblique arrows) Following from this rule, species inhabiting hygrophytic sites in the northern part of the range

can fall out entirely from southern areas, because there are no habitats damper than hygrophytic ones (shown with dotted arrows). Mecostethus grossus L. can serve as an example. It inhabits swamps in the forest and steppe zones, and is entirely absent in the desert zone.

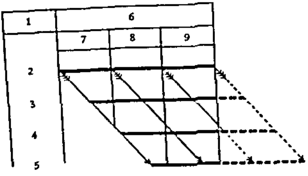

Figure 36. Graph defining the rule of zonal change of habitats. (According to Bei-Bienko)

1—zones, 2—forest; 3—forest-steppe; 4—steppe, 5—semi-desert, 6—distribution of species, according to habitats, 7—xerophytic habitats; 8—mesophytic habitats; 9—hygrophytic habitats.

The zonal change of habitats is explained by the increase of temperatures for the plant growth period toward the south; the amount of solar heat (effective radiation) received per cm^2 of the earth's surface can serve as an indication. At latitude 65° North (taiga zone) it is 68 kilocalories, at latitude 50° North (steppe zone) it is 85 kilocalories, and at latitude 40° North it is 107 kilocalories. Therefore, if one and the same species inhabit outwardly similar habitats (e.g., sandy plots) in the forest and desert zones, it would find itself under two entirely different thermal schedules; the temperature on the surface of sandy plots in deserts may reach 65° C, while in the taiga it never exceeds 35-40° C.

Thus, outwardly similar habitats have in reality entirely different microclimates, and species with a wide area of distribution are obliged to live in southern parts, i.e., in damper and more shaded habitats, where the effect of the southern sun is reduced.

It must be noted that the zonal change of habitats can affect the behavior of certain species; thus, Gomphocerus sibiricus L. and other solitary grasshopper species stay near plants, and are therefore, mainly phytophiles, while in the taiga zone the above species choose sandy plots with a sparse grass stand, and do not avoid the soil surface, i.e., acquire features transitory to that of typical open-land geophiles. Hence, although the microclimate in these habitats is similar, other environmental conditions differ, a fact that affects the differentiation of the species. For example, it is known that Locusta migratoria is represented in the North by a special subspecies—Locusta migratoria rossica Uv. et Zol.; Pararcyptera microptera F.-W. is replaced in the south by other subspecies

45 living among a denser vegetation, and so on. Similarly, a widely-distributed species is obliged, as a result of the zonal change of habitats, to reconstruct its ecological features, a fact that may create conditions for the change of the life form itself (see the section "Life Forms"). Thus, the phenomenon of the zonal change of habitats is important not only for understanding of the ecology of certain widely-distributed species, but is also of definite interest from the general biological point of view.

Abiotic Environmental Factors. Ecological factors were examined above in connection with their specific role in the creation of habitation conditions for the species. However, abiotic and biotic environmental factors are of a greater general importance in the life of grasshoppers. The role of such factors as temperature and moisture of the environment, is especially important. It is not possible in this book to give a detailed analysis of the role of these factors, though their primary importance has been revealed in the study of the ecology of a number of injurious species, and it is established that mass occurrence of these species is often caused by weather conditions, especially by the favorable effect of temperature and moisture.

Locusta migratoria rossica Uv. et Zol. and Dociostaurus maroccanus Thunb. can be cited as examples

Locusta migratoria rossica inhabits sandy areas of the middle belt of the European part of the U S S R , it suffers in cool years from insufficient heat and abundance of moisture, and its development is consequently slowed down The majority of individuals do not become entirely mature prior to the beginning of fall cold snaps, or give a decreased genital production. As a result, grasshopper numbers remain small during the subsequent year. In dry and hot years, when the average air temperature for the plant growth period (April-September) becomes higher than the critical point (13.8° C), and the rainfall is below 320 mm, the rate of development of the grasshoppers increases. As a result, sexual maturation is completed by the end of July or the beginning of August, and the insects succeed in laying their eggs prior to the onset of cold Two subsequent favorable years are enough to cause mass reproduction during the third subsequent year in areas where favorable habitats are still retained, namely, bastard fallows, waste lands, and spring-crop fields on dry sandy soils (Predtechenskii, 1928a, 1930a, 1930b, Aleinikova, 1950).

The amount of rainfall, but not the temperature, under otherwise equal conditions, *especially during the spring period, is a leading ecological factor* affecting the numbers of Dociostaurus maroccanus in Middle Asia, the Transcaucasus, and Ciscaucasus. It has been established that the most favorable conditions for the existence of this species are created in an area where the amount of rainfall in spring is about 100 mm or a little more.

Such an amount of moisture does not cause the destruction of the eggs in the pods, and the larvae are provided with a sufficient amount of green food for the spring period *An abundance or lack of moisture in spring ruins* egg-pods, and unfavorably affects the life of larval and adult individuals, finally leading to a sharp decrease in locust numbers (Bei-Bienko, 1936b).

The adduced examples show the variations in numbers due to the effect of one of the climatic factors, either temperature or moisture, one of them being the chief, or the leading, factor.

46 The effect of climatic or other physical factors on other locust and grasshopper species may differ in characteristic features, but has been studied only in a few species: Locusta migratoria L. (Olsuf'ev, 1930; Zakharov, 1937, 1938a, 1938b, 1946b) and Schistocerca gregaria (Predtechenskii, 1935b), as well as in certain solitary locusts and grasshoppers (Rubtsov, 1935a, 1935b).

Biotic Environmental Factors. Apart from abiotic, especially climatic factors, biotic factors in the form of various natural enemies play an important role in the life of locusts and grasshoppers. To these belong parasites, predators, and causative agents of diseases. All grasshopper stages—eggs, larvae, and adult individuals, may suffer from the above natural enemies. In addition, an important role in the life of grasshoppers is played by the plant cover, which creates indispensable environmental conditions—on the one hand, source of food, and on the other, the factor determining certain physical conditions of existence, namely, the microclimate. However, these questions have been examined above (see page 40), and we shall therefore concern ourselves only with biotic factors, i.e., the role of parasites, predators, and causative agents of diseases.

The enemies of locusts and grasshoppers are especially varied among insects. To them belong, first of all, the enemies of eggs; the majority of these species being closely connected biologically with the locusts and grasshoppers and true parasitizors of egg-pods. The most common parasites are the numerous beetle species of the family Meloidae, namely, the blister beetles of the genera Mylabris Fabr. and Epicauta Redt. which develop by passing through a succession of larval forms (hypermetamorphosis). Species of the genus Trichodes Hbst. (Cleridae) are also known as parasites of the egg-pods. Diptera are also common parasites of the egg-pods. The most numerous among them are the species of the family Bombyliidae, but several species of the families Larvivoridae, Muscidae, and others are also known. Representatives of the order Hymenoptera, namely of the families Proctotrupidae (of the genera Scelio Latr., Phanurus Thom., and others) and Chalcididae are also known as parasites of egg-pods. The larvae of the above-mentioned insects develop at the expense of eggs in the egg-pods of various grasshopper species; certain bombyliids (e.g., Anthrax oophagus Par.) may be primary parasites of grasshopper eggs, as well as secondary parasites living in the egg-pods at the expense of parasitic larvae of other bombyliids and meloids.

Among the enemies of egg-pods there are also predatory insects. To these belong in particular the bombyliid Percosia equestris Duft. Its larvae devour the eggs in the egg-pods of Calliptamus italicus in the southern part of the Ukraine (Kirichenko, 1926).

Parasitic insects and predators are also among the enemies of grasshopper larvae and adults. The true parasites are only found among Diptera, to which belong numerous viviparous species of the family Larvivoridae, especially of the genera Blaesoxypha Lw. and Sarcophaga Mg., as well as a few representatives of other families, in particular Acridomyia sacharovi Stack. (Muscidae), a rather peculiar parasite of Locusta migratoria L. The larvae of the above parasitic flies live inside the body cavity of larval and adult grasshopper individuals, and feed on the fat-body and hemolymph. Parasitism leads to weakening of the host and to an inadequate development of the genital system, followed by a decrease in

47 genital production and, sometimes, complete sterility. The death of locusts and grasshoppers infested by parasitic larvivorids is more often observed in the larvae and at the beginning of the acquirement of wings by the host, but death does not always occur. In Acridomyia sacharovi Stack., which is present in numbers of up to 100-157 larvae (38 being the average) per single host specimen, the usual outcome of the infestation is death of the host.

Certain predatory insects and wasps are other enemies of grasshopper larvae and adults. Among predatory insects our attention is especially often attracted by asilids, which usually fly with the caught prey. Because of the relatively small size of the above flies, they cannot manage large grasshopper species, like Locusta migratoria, many Pamphaginae, and others, thus various small solitary grasshoppers of the genera Chorthippus Fieb., Stenobothrus Fisch., and others are the common victims of these predators. Certain large long-horned grasshoppers, e.g., of the genera Decticus Serv. and Saga Charp., and various Mantoidea are the common enemies of locusts and grasshoppers. Mantids, as well as the species of the genus Saga are interesting because they lie in wait for their prey, and have strongly-armed limbs for catching and firmly holding it.

Certain representatives of the wasp Sphecidae family are the enemies of the grasshoppers. They attack adult or larval individuals and paralyze the prey with their stings, with the subsequent removal of the prey to a burrow prepared beforehand, where the eggs are laid on its motionless body. The hatched-out larvae feed on fresh food during their life.

The above-mentioned grasshopper enemies differ in importance. Wasps and carnivorous insects destroy only individual locust and grasshopper specimens, and can hardly be of real importance in the decrease of their numbers. The role of parasitic flies living at the expense of larval and adult grasshopper specimens cannot be considered of real importance either. During the dissection of Locusta migratoria the impressive sight of a specimen infested with tens of specimens of Acridomyia sacharovi Stack., is not demonstrative, because the percentage of infestation of gregarious grasshoppers is very small, not exceeding a few per cent. Similarly, the role of other parasitic flies, at least with regard to Locusta migratoria, is not significant, because only about a half of the infested grasshoppers are destroyed, and the genital production of these specimens remaining alive is decreased by about a third (average), as compared to normal. The rate of infestation remains very low and never exceeds a few per cent. Hence, Diptera, as parasites of active grasshopper stages, cannot be considered a significant biotic factor in the dynamics of grasshoppers. Only when swarms are thinned-out, as a result of control measures or other effects, can the parasitic Diptera destroy the remaining specimens. These are the role and importance of parasitic Diptera in the dynamics of grasshoppers, as revealed by Russian scientists mainly on the basis of the study of Locusta migratoria (Olsuf'ev, 1929, Rykavishnikov, 1930).

As to parasites of egg-pods, their role in the dynamics of grasshoppers is not the same in all cases. Thus, in Eastern Siberia 13 parasitic species, mainly blister beetles, were recorded in Pararcyptera microptera F.-W.; in Gomphocerus sibiricus and Stauroderus scalaris
48 F.-W. —only 6 parasitic species in each, mainly Diptera in the former and

and Hymenoptera in the latter; and, finally, only 2 parasitic species were recorded in Arcyptera fusca Pall. Only in Pararcyptera microptera F.-W. does the infestation reach a considerable extent, with an average of not less than half of the egg-pods infested, while in the other species the role of parasites remains insignificant (Rubtsov, 1933b). It must be noted that in the eastern part of Western Siberia instances of considerable infestation of egg-pods of Stauroderus scalaris F.-W. by the larvae of the egg-parasite Scelio vulgaris Kieff. (Proctotrupidae) have been recorded. The opinion, therefore, exists, that the above parasite can have a marked effect on the decrease of the numbers of Stauroderus scalaris during certain years (Berezhkova, 1935). There have been recorded instances of egg-pod reserves of Dociostaurus maroccanus being decreased as a result of attacks of parasitic blister beetles, the decrease of the entire egg-pod deposit in Azerbaijan reaching an average of 22% (Zakhvatkin, 1934a).

One must, therefore, admit that the parasites of egg-pods play a certain role in the decrease in numbers of Dociostaurus maroccanus. For insects which are *enemies of grasshoppers see also:* Zakhvatkin, 1931, 1934b; Porchinskii, 1914; Rodendorf, 1928 and 1932; Uvarov, 1927b; Shtakel'berg, 1929.

Among other invertebrates which are locust and grasshopper enemies, red mites (Trombidiidae) are most often mentioned. The larvae of these mites are external parasites attaching themselves to the wing membrane, while the nymphs and adults are parasites of egg-pods. The biological features of these mites were studied from Eutrombidium debilipes Leon., which is one of the parasites of Locusta migratoria L. This mite does not cause great harm as an external parasite, but as a parasite of egg-pods it can sometimes be important, as it can lead to the destruction of 20% and more of the entire egg-pod deposit, not to mention that the penetration of the mite into the egg-pod creates favorable conditions for the infection of the latter by fungous and bacterial diseases (Popova, 1932).

Sometimes grasshoppers become victims of spiders, but probably only of a few species. It has been established by P. Marikovskii that various locusts and grasshoppers are particularly frequently found in the diet of adult specimens of the notorious poisonous steppe spider (Lathrodectus tredecimguttatus).

Grasshoppers also have internal parasites, namely, nematodes and gregarines. Certain species of the family Mermithidae belong to the former. These parasites have a thin and long body (up to 10-20 cm and longer) and live solitarily or in groups in the body of the grasshopper, especially inside the abdomen, causing the depletion and death of the host. Gregarines are protozoan organisms which are intestinal parasites, the infestation occurring through food as the spores of these microorganisms are always present in soil and plants; the number of these parasites sometimes reaches 50 specimens per grasshopper.

Mermithids cause the weakening and often the death of the host, but their role in the decrease of grasshopper numbers is probably insignificant. The importance of gregarines is not sufficiently clear, but the fact that they feed on hydrolized food products, as well as on the cells of the intestinal tract which are destroyed by the penetration of the anterior section of the parasite, affects the condition of the host. For a review of data on parasitic

orms and gregarines see Uvarov (1927b) Certain data on the biology of he parasitic mermithid are given in the paper by Shamenov (1945)

Among the vertebrates, certain birds may be of considerable importance n the destruction of grasshoppers Similarly, grasshoppers serve as food or certain mammals (rodents, hedge-hogs, and others), reptiles (lizards, nakes), and amphibians (toads). The role of birds is most noticeable, in particular that of starlings (the Rosy Pastor and the Black Lark), flocks of starlings very often appearing at points of locust and grasshopper concentration. The importance of these birds is, however, very often overestimated, and mass outbreaks of grasshopper reproductions can hardly be suppressed by starlings or other birds At the same time one cannot disregard the positive role played by birds in killing-off of grasshoppers after the period of reproduction, as well as in the case of bands thinned out by control measures There are known cases of a complete annihilation of dispersed bands of Dociostaurus maroccanus by the Rosy Pastor which remained after the application of chemical control measures

Grasshoppers often suffer from fungous and bacterial diseases The fungus Empusa grylli Fres (of the family Entomophthoraceae in the group of Phycomycetes) is the most common and widely-distributed causal organism of disease in a number of grasshopper species (especially in certain solitary grasshoppers and Calliptamus italicus) Epidemics of this disease occur during damp and warm weather, and often promptly embraces a wide territory, thus contributing to the clearing of the multitude of locusts and grasshoppers This disease does not appear under normal weather conditions Grasshoppers and locusts affected by the fungus, climb the plants and embrace the tops of the stems with their fore- and mid-legs, remaining in this position also after death Vinokurov (1949b) has recently shown that this disease is caused by a complex of microorganisms, fungi and bacteria, probably interrelated symbiotically The effect of these microorganisms causes an inevitable sharp decrease in the fertility of grasshoppers in those cases where there is no fatal outcome In this connection the above author offers a new method of control, based on the sterilization of grasshoppers by infecting them artificially with these microorganisms

A disease of the eggs in egg-pods of Dociostaurus maroccanus caused by a parasitic fungus of the genus Fusarium of the group Hyphomycetes is of considerable importance in U S S R conditions An excess of rainfall during the spring period creates favorable conditions for infection of the egg-pods with this fungus and causes destruction of the eggs Under these conditions the mentioned causative agent of the disease becomes one of the most important factors restricting the mass reproduction of Dociostaurus maroccanus (Bei-Bienko, 1936b) (For additional data on fungous diseases in grasshoppers see Benua, 1928 and Uvarov, 1927b)

Bacterial diseases attracted attention long ago in connection with attempts to utilize one of the causative agents namely, the Coccobacillus acridiorum for the purpose of locust and grasshopper control All these attempts failed Pospelov (1926) proved that Coccobacillus acridiorum is a symbiont of locusts under normal conditions, and only with the worsening of living conditions, especially under the effect of lowered temperature and high humidity, is the reproduction of these microorganisms

intensified in the body of a locust, and the microorganisms become pathogenic. These findings of Pospelov's research are very significant theoretically. Firstly, they showed the possibility of transition of the causal organism from the antagonistic to the symbiotic state and vice versa. Secondly, they revealed in this process the leading role of the host's state which
50 is determined by environmental factors. Hence the importance of the affecting factor, i.e., the causative agent of the disease, is determined eventually by the host's living conditions which change the state of the host, including the metabolic rate, and hence its susceptibility to diseases. There can also be no doubt, that mass death of grasshoppers from fungous diseases observed, as described above, in damp cool years, takes place not only because the above weather conditions are favorable for the development of the causative agent, but also because the weather conditions are unfavorable for the locusts and grasshoppers themselves, being conducive to a lower metabolic rate and a higher susceptibility to diseases.

The above adduced data on natural enemies show that their various roles in the dynamics of grasshoppers are far from being the same. Only some of the natural enemies, either independently or together with other natural enemies and other environmental factors, may play a significant role in restricting grasshopper numbers. Attempts to utilize these natural enemies in the control of injurious grasshopper species were one-sided and futile. It seems that only Vinokurov (1949b) had some indications of positive results; there can be no doubt that a profound study of the biology of natural enemies and their interrelations with grasshoppers will reveal new data, and open new vistas on the utilization of these living forces of nature in the control of injurious species.

Natural Associations of Grasshoppers. An indication has been given above of the adaptability of grasshopper species to particular habitats. These habitats are, however, the scene of life activity of an entire complex of species, not of individual isolated species, and, therefore each type of habitat has its own grasshoppers and its natural association of species. Where some possess similar ecological requirements and are predominant, others occur in smaller numbers or singly. These grasshopper associations, however (sometimes called acridocoenoses), are not a simple complex of species united only by similar requirements to certain habitats and isolated from other organisms. Various grasshopper species of one or another association are an integral part of the respective habitats, and are connected with other organisms on the basis of food-chains (their food-plants and natural enemies). Connections between different grasshopper species arise through common food-plants and common natural enemies. Therefore the grasshopper associations are only one of various constantly operating, visible components of respective associations of living organisms, or biocoenoses.

The typification of habitats according to the nature of plant and soil covers, i.e., the establishment of the composition of natural plant associations, their areas of distribution, and their role in the creation of the landscape of the given natural zone, is the first task in the study of locust and grasshopper associations. This task is made easier, as good geobotanic descriptions of many parts of the U.S.S.R. are available. With such information it is not difficult to clarify the composition of grasshopper species and their associations by applying suitable methods for estimating the numbers of each species.

However, the most interesting stage in research from theoretical and practical points of view, is the next one, namely, study of the ecological succession of locust and grasshopper associations under the effect of man's economic activity (felling of forests, plowing of virgin lands, creation of forest shelter belts, grazing of cattle, reclamation measures, etc.) and also natural causes, i.e., the continuous succession of natural conditions.

The study of the succession of grasshopper associations under the effect of man's economic activity showed that all types of economic activity with regard to the landscape inevitably lead to the succession of grasshopper associations. The nature of this succession, however, differs in its dependence on different types of economic activity. Plowing of virgin lands and intensive grazing of cattle are conducive to an extinction or a decrease in the numbers of many species, but on the other hand a certain few species find in the new situation especially favorable conditions and greatly increase in numbers, sometimes becoming dangerous pests of agricultural crops. Felling of forests is conducive to increase of locusts and grasshoppers in numbers in the area, as well as an increase in their specific composition Planting of forests and forest shelter belts, on the other hand, causes a decrease in numbers and specific composition of grasshoppers

Therefore, the elucidation of the regular pattern of succession of locust and grasshopper associations is necessary for the management of the dynamics of injurious species by means of progressive farming methods.

It is therefore clear that grasshoppers, like many other organisms, take part in the creation of natural and cultivated landscapes respectively, and may be of importance in the description of the latter's peculiar features At the same time grasshoppers lead an open mode of life, have relatively large body dimensions, and occur not as single individuals, but in noticeable numbers. They are also easily detected due to stridulation and activity at the height of summer, when other insects are often either in passive stages of development (larvae or pupae) or in the state of a diapause, or lead a nocturnal mode of life. Owing to these characteristics, grasshoppers as a whole, including harmless species, are a more noticeable component of the landscape than certain, rarely-occurring vertebrates, as well as many insects Appropriate concise data on the features of the locusts and grasshoppers and their associations in the landscapes of the U.S.S.R are given in the special part (see pages 54-67) (See also the following papers dealing with research on grasshopper associations Baranov and Bei-Bienko, 1926, Bei-Bienko, 1930b, 1949b, 1949c, Bystritskii, 1933, Davletshina, 1948, Derevitskaya, 1949, Levkovich, 1950, Medvedev, 1928, Nefedov, 1932, 1936, 1939, Predtechenskii, 1928a, 1928b, 1930a, Rubtsov, 1932b, 1933a, Strakhovskii, 1935, Chetyrkina, 1950)

Life Forms The creative role of selection and the adaptive development of a species create the accord between the organism and its environment The sum total of specific morphological, biological, and physiological features which are in accord with environmental conditions, to which the given species becomes most adapted in the course of its historical development, make up the life form. The gamut of adaptations accumulated during many millenia is revealed in each species Therefore, the life form is a condensation of the fundamental features of a species, a "living mirror" in which are

reflected the main environmental features. In the first place the type of habitat is a summarized index of living conditions, and also the biotic interrelations with other organisms of plant and animal origin.

Grasshoppers and locusts, as one of the ancient groups of insects, are
2 not a monotonous complex of outwardly similar species and genera. A simple comparison of such common species as Chorthippus albomarginatus Deg., Sphingonotus coerulans L., and Tetrix subulata L. already gives us some idea not only of their morphological taxonomic differentiation, but also of the sharp differences in their ecology and behavior as reflected in the external appearance of these insects.

All grasshoppers can be subdivided into the following life forms (Figure 37), the description of which has also been given in other papers (Bei-Bienko, 1948, 1950b, 1950c).

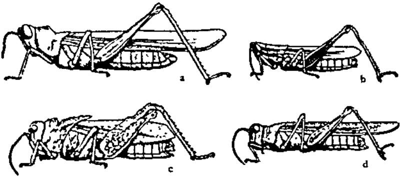

Figure 37 a-d. External appearance of representatives of some life-forms of grasshoppers. (Original)

Above—phytophiles, below—geophiles. a—tamnobiont (Dericorys annulatus roseipennis (Redt.)), b—chortobiont (Euchorthippus pulvinatus (F.-W.)), c—open-land geophile (Asiotmethis muricatus (Pall.)), and d—psammobiont (Hyalorrhipis clausi (Ev.)).

Class I. Inhabitants of Plants, or Phytophiles.

1. Chortobionts, i.e., inhabitants of the thickness of grassy covers including cereal grasses, which feed mainly on cereal grasses (Chrysochraon Fieb., Ochrilidia Stål, Stenobothrus Fisch., Chorthippus Fieb., Ramburiella Bol., Aiolopus Fieb., Locusta L., Tropidopola Stål, Gonista Bol., and others).

The following are modifications of typical chortobionts:

a) facultative chortobionts, i.e., inhabitants of the grassy cover which do not avoid open areas of the soil surface (certain Dociostaurus Fieb., as well as Notostaurus B.-Bienko and others); these species are transitory to geophiles.

b) herbivorous chortobionts, which are consumers of broad-leaved herbaceous plants (herbs) and, in case of a sufficient supply of the latter, avoid eating cereal grasses (Calliptamus Serv., Podisma Berth., Conophyma Zub., and others). Some of these species have features transitory to tamnobionts.

?. Tamnobionts, inhabitants of shrubs and trees (many Eumastacidae, well as Dericorys Fieb., Anacridium Uv., Thisoicetrus -W., Euprepocnemis Fieb., and others).

CLASS II INHABITANTS OF THE SOIL SURFACE, OR GEOPHILES

1. Open-land geophiles, i.e., inhabitants of open plots on the surface he soil (Sphingonotus Fieb., Oedipoda Latr., Bryodema Fieb., iotmethis Uv., certain Dociostaurus Fieb., and others). The owing are specialized forms of open-land geophiles·

a) psammobionts, or sand-dwellers, i.e., inhabitants of dry sandy strates, adapted to life and movements in soft sands (Hyalorrhipis ss., Leptopternis Sauss., Strumiger Zub., certain Thrinchus -W , and others);

b) petrobionts, or rock-dwellers, i.e., inhabitants of rocky substrates ;zotmethis Uv., as well as the following representatives of the tribe nphagini (subfamily Pamphaginae)· Tropidauchen Sauss., Nocaros F.-W , and others).

2. Gerpetobionts, or concealed geophiles, i.e., inhabitants of the soil face covered with vegetation, fallen leaves, plant or other debris, inuting also small open plots with a damp soil substrate on the banks of ter bodies (many Tetrigidae, among other grasshoppers—Chortogos Serv.).

The class of phytophiles is characterized by an elongated, slender body h smooth integuments devoid of coarse sculpture, usually (but not always) orless hind wings, well-developed empodia between tarsal claws, and erally compressed body. The W/H index, i.e., the ratio of the width of body to its height measured at the cross-section of the widest part (in area of the metathorax) is always below one.

The chortobionts have a streamlined body, often a sloping front, the body usually greenish or has the color of dry grass, dark stripes are often esent on the sides, and the hind tibias are symmetrically armed. This oup feeds mainly on cereal grasses and has appropriate mouth organs :e description of these organs on page 6) The species of this group e adapted for life and movement in the thickness of the grassy cover and e typical inhabitants of open associations of grassy plants with a considerle preponderance of cereal grasses, as in steppes, meadows, savannahs, :. Certain species are closely connected with particular plant species d hardly ever leave them (Ochrilidia Stål, Ramburiella Bol., ropidopola Stål). The majority of species injurious to agriculture bengs to this group.

The facultative chortobionts comprise a peculiar sub-group These spees, although often living in a dense grass stand, do not utilize the latter itirely and do not avoid open areas on the soil surface. Therefore these ecies are transitory to open land geophiles and, like the latter, are char:terized by small empodia between the tarsal claws, as well as often a ore thickset body and a weakly sloping or vertical front.

The herbivorous chortobionts comprise another sub-group These spees, like typical chortobionts, live in grass, but feed mainly on broadaved plants and have appropriately adapted mouth organs (see pages -7) These species have a vertical front and usually a more thickset body :ructure than the typical chortobionts, and inhabit mixed-grass plant comunities with a considerable preponderance of dicotyledonous plants,

sometimes of a subshrub type (e.g., wormwood). Herbivorous chortobionts originate, probably, from tamnobionts and in certain cases possess traits transitory to the latter.

The group of tamnobionts is characterized by asymmetry in the armature
54 of the hind tibias, i.e., the spurs of the inner row are longer than those of the outer row in typical representatives of this life form; certain species (Gomphomastax Br.-W.) even having asymmetrical tarsal claws, many being distinguished by strongly-developed empodia between the claws, while others have elongated and slender tarsi. The close connection of certain species with particular plants begins to appear in this group. Thus, Gomphomastax juniperi B.-Bienko selects juniper, Phytomastax artemisiana B.-Bienko —wormwood, Dericorys annulatus roseipennis Redt.-Haloxylon, and so on No such close connection exists, however, in the majority of these species, and certain Gomphomastacinae, for example, readily inhabit small shrubs of Caragana and wormwood.

The class of geophiles is distinguished by usually coarse sculpture of body integuments (rugose, tuberculose, or strongly dotted); earthy general coloration of the body, often with brightly colored hind wings or hind tibias with sometimes a distinct growth of thin hair on the body (except the ventral part of the body); and also always by feebly-developed empodia between the claws, which are sometimes entirely lacking. In the majority of cases the body of these species is more flattened than the body of phytophiles, hence the W/H index reaches one and higher.

This class is most widely represented within the U.S.S.R. by the group of open-land geophiles, occurring mainly in deserts and semi-deserts, as well as in azonal biotopes of the steppe zone, such as outlets of rocks, sandy areas, solonchaks, pebbles along river banks, etc.

Certain most specialized representatives of this group are adapted to live only in a single substrate, either sands or rocks. These species differ from usual open land geophiles in additional morphological traits. Thus the hind tibias of psammobionts bear elongated spurs facilitating the push-off during the jump in a loose substrate. These species are typical of sandy deserts in Middle Asia and adjacent countries.

As to petrobionts, many are distinguished from all the other representatives of the class of geophiles by a high pronotum, due to a strongly elevated median carina. As a result, their W/H index, like that of phytophiles, becomes less than one. Examples are all the representatives of the tribe Pamphagini, as well as a few representatives of the tribe Thrinchini, e.g., Pezotmethis Uv. However, certain typical inhabitants of rocky substrates do not differ at all from usual open land geophiles in external features, e.g., some representatives of the genus Pseudoceles Bol., Sphingonotus nebulosus F.-W., Asiotmethis heptapotamicus Zub., and others. On the other hand certain open land geophiles, e.g., Pyrgodera armata F.-W., have, like petrobionts, a high pronotum. The fact that the larvae of Pyrgodera armata F.-W. have a green coloration, similar to that of certain typical petrobionts of the tribe Pamphagini (e.g., certain species of the genus Tropidauchen Sauss.), permits the assumption that all these species are connected with plants, i.e., they were phytophiles during the extensive period of their evolution. Their low W/H ratio indicates their phytophilic origin. At the present time this connection has been lost owing to the adjustment of the mentioned

forms to life on the soil surface, though they have preserved in their morphology certain features of the phytophilic life form

The group of gerpetobionts is represented by only a few grasshoppers.
55 Life in shaded situations and an increased requirement for moisture are the essential features of this group, though in certain cases a damp substrate can compensate even for a lack of shade, e.g., along water-body banks. At least some of the gerpetobionts (Tetrigidae) differ from the other grasshoppers in their food habits, feeding on soil algae, lichens, and probably on plant debris. It is also typical that all the representatives of this life form overwinter in larval or adult stages, but not in the egg stage. As to morphological features, it is difficult to describe the typical ones, They have a somewhat fusiform body (narrowed anteriad and caudad from the metathorax) which is the most distinctly-expressed feature, as well as lateral lobes of the pronotum spaced in their posterior part and also a distinct color on the prosternum. All the other features, except the coloration of wings and hind tibias, are similar to those of open land geophiles.

The above described life forms of grasshoppers cover only the most typical and distinctive cases, and there can be no doubt that various transitions between them are possible. Some of these transitory forms have been indicated in the description of life forms. The analysis of these transitions and the accompanying circumstances, without going into details, permits us to outline certain generalizations important for understanding the nature of the life forms.

It should be noted that the life form of a species is a specialized and conservative feature. The conservatism of the life form does not, however, close the way to further development and reconstruction of a species and even working-out of the features of a new life form. Most diverse and sometimes unexpected ways of adaptive development in organisms is possible in nature, and though the revelation of these ways is not an easy task, some of them may be deciphered even in our times. The need for the reconstruction of a species arises when it is distributed and penetrates into other landscape zones, where, according to the rule of zonal change of habitats, it is compelled to change its type of habitat radically. Similarly, the eternal succession of climate and landscape makes essential for the species the task of morpho-biological reconstruction and adjustment to new conditions.

The morphological features of a life form are its most conservative features, while the physiological (ecological) features are the most flexible and capable of reconstruction The reconstruction of a species starts, therefore, with the reconstruction of its physiological features, i.e., its requirements from the environment Consequently, instances are sometimes observed when one or another species or even a group or related species possess morphological features of one life form, while their ecological features have already been reconstructed into another life form. *Pyrgodera armata* F.-W. and many Pamphagini can serve as examples. These species are probably descendants of phytophiles and have retained certain morphological traits of the latter (W/H ratio below one), but ecologically they are already reconstructed into geophiles. Similarly, species of the genus *Mesasippus* Tarb. are open land geophiles as judged by their ecological features, while morphologically they have still retained typical traits of chortobionts, peculiar to their closest relative *Chorthippus* Fieb The opposite direction of evolution is typical of *Sphingonotus*

56 halocnemi Uv., and this species is still morphologically an open land geophile, as are all the other representatives of the genus Sphingonotus, although being ecologically connected with Salsoleae and also being a tamnobiont.

Cases are sometimes observed in which not only the morphological, but also the ecological properties of the life form are retained, in spite of a sharp change in environmental conditions. This trend is observed when natural formations of the landscape change in connection with eternal succession in climate, vegetative cover, and geo-morphological features of a country. Species that have survived these changes are compelled to move to new substitute habitats. Among the chortobionts, certain descendants of arrivals from subtropical savannahs can serve as an example, namely, Ochrilidia hebetata Uv. or Tropidopola turanica Uv. The former lives in hilly or ridgy sands of Middle Asia and southern Kazakhstan on shrubs of Aristida pennata (Gramineae) without which it cannot exist, while the latter lives in reed-beds along the banks of rivers.

A replacement of one life form by another can take place, of course, by means of a reconstruction not only of eco-biological, but also of morphological properties. Two main trends are possible in this case: specialization of a species by acquiring new morphological features, while not disturbing the basic style of the life form of a higher order, and a radical reconstruction of the life form. Hyalorrhipis Sauss. can serve as an example of specialization. These species are the closest relatives of open land geophiles—Sphingonotus Fieb., but differ from the latter in strongly-elongated spurs of the hind tibias which makes movement in loose substrates easier. There can be no doubt that in this case a less-specialized form of open land geophile (of Sphingonotus Fieb. type) was the initial form for the more specialized life form of the psammobiont (Hyalorrhipis Sauss.). The trend of radical reconstruction in a life form of the highest order into a new life form of the same order, is undoubtedly the most difficult and protracted. Representatives of the tribe Thrinchini (of the subfamily Pamphaginae) can serve as a possible example, the majority of these species are geophiles of various types in the contemporary period, but they probably originated from phytophiles.

The adduced examples reflect various stages and results of reconstruction of the life forms in locusts and grasshoppers. The observed cases of discrepancy between the morphological features of the life form and environmental factors do not disturb the harmonious unity of the life form and its environment. The organism is not a frozen and motionless biological system, and all the contradictions between the organism and its environment are a reflection of eternal forces of nature which for centuries and millennia move the organisms along the path of their development.

CHARACTERISTICS OF LOCUSTS AND GRASSHOPPERS OF THE U.S.S.R.

The study of locusts and grasshoppers in the U.S.S.R. dates back to the second half of the 18th century. Two volumes of "Travels" ("Puteshestviya") by P. Pallas and the 9th issue of his "Spicilegia Zoologica" were published

in 1771-1773. Nine new species, discovered by this author during his travels in the southeastern and Asiatic parts of Russia, were described in the above books. New data were accumulated during the first half and the
57 middle of the 19th century by the Moscow naturalist G. Fischer-Waldheim, by the gifted entomologist-taxonomist V. Mochul'skii, who traveled all over the country and gathered insect collections, and in Kazan by M. Kittary and Professor E. Eversman. The first fundamental summarizing treatise on grasshoppers and other Orthoptera of Russia—"Orthoptera Imperii Rossici" by Fischer-Waldheim—appeared in Moscow in 1846. It contained descriptions and drawings of 85 grasshopper species peculiar to Russia and included the species and genera discovered by Mochul'skii.

A number of papers (by P. Ivanov, I. Ingenitskii, A. Krulikovskii, V. Rodzyanko, V. Yakovlev, V. Yaroshevskii and others) on the fauna of different parts of Russia appeared during the second half of the 19th century and contributed to a further broadening of our knowledge on this group of insects. The paper by P. Ivanov, published in 1887, deserves special mention, for it contained extensive research on the fauna of the Kharkov province and had keys. A series of remarkable papers by N. Zubovskii appeared in 1896-1900, this author adding 17 new species to the list of Russian grasshoppers and clarifying a number of complicated taxonomic problems. Unfortunately, the above author was not appreciated in circles of the then Zoological Museum of the Academy of Sciences, and instead of him, a well-educated, but narrow-minded person, N. Adelung, was invited to fill a vacancy. The latter accomplished very little during the 20 years that he worked in the Museum, publishing descriptions of only 8 new species, 3 of which proved to be synonyms. The vast grasshopper collections accumulated in the Museum, including those of the prominent Russian travelers P. Kozlov and G. Potanin, remained untreated.

The publication in 1905 (the first issues appeared in 1902) of the basic work — "Orthoptera and Pseudoneuroptera of the Russian Empire" (*Pryamokrylye lozhnosetchatokrylye Rossiiskoi imperii i sopredel'nykh stran*) in which all the Orthoptera were worked out by G.G. Jakobson, was a new and important step in the study of locusts and grasshoppers of Russia. It contained 275 grasshopper species, including 151 species from Russia. The publication of this book, which was the only one in world literature dealing with so vast a territory, greatly increased interest in the study of this group of insects and created a new school of scientists. A number of papers by N. Ikonnikov, E Miram, E. Pyl'nov, A Shugurov, Ya. Shchelkanovtsev, B. Uvarov and others appeared. After the October Socialist Revolution, Jakobson's book led to the appearance of a new generation of entomologists R. Berezhkov, S Predtechenskii, S Tarbinskii, N. Umnov, the authors of this book, and others, who specialized in the study of locusts and grasshoppers. However, in addition to study of the fauna and taxonomy of grasshoppers, they also devoted their research efforts to theoretical and practical aspects of the control of grasshopper pests At the same time a number of old- and new-generation experts studied grasshopper biology, which served as a foundation for the improvement of control measures (the papers by V. Plotnikov, L. Zakharov, V. Nikol'skii, I. Rubtsov, G Vinokurov, B. Pukhov, et al) In the field of taxonomic and faunal research the scientists of the older generation successfully continued their work. Professor P. Shchelkanovtsev and E Miram, the latter in charge of precious

To these species belong Mecostethus grossus L., which lives in sedge swamps and meadows, Chorthippus montanus Charp., which is usually found with it, and Tetrix subulata L. The complex of species inhabiting the rich cereal-mixed-grass meadows on forest margins and adjacent woodless areas has a similarly wide distribution. It is composed of Omocestus viridulus L., Gomphocerippus rufus L., Chrysochraon dispar Germ., and Stauroderus scalaris F.-W. In the taiga zone, beginning from the town Tomsk and eastward, Podismopsis poppiusi Mir. appears in addition to the above-mentioned species or to some of them.

Psophus stridulus L, Podisma pedestris L., Euthystira brachyptera Ocsk., Omocestus haemorrhoidalis Charp., and other species appear on meadows of the mixed and broad-leaved forest zone of the European part of the U.S.S.R., but in Siberia a part of the enumerated species also penetrate into the taiga zone. The fauna of open, dry, sandy areas, particularly those that appeared as a result of felling of forests, is very characteristic. Within the taiga zone occur: Chorthippus [?] iguttulus L., Tetrix bipunctata L., sometimes Myrmeleotettix maculatus Thunb., and in western Siberia—Gomphocerus sibiricus L. But on the sands of the mixed and broad-leaved forest zone, the following species become especially widely distributed Chorthippus pullus Phil., Sphingonotus coerulans cyanopterus Charp., and along the zone's southern border—Locusta migratoria rossica Uv. et Zol., which sometimes multiplies there en masse However, the fauna of these zones is poor in species, in particular the taiga zone, which has not more than 45 species.

The broad-leaved forests of the Far East are distinguished by a rich and diverse grasshopper fauna, somewhat resembling that of the broad-leaved forests of the European type, but with their own distinct traits. Unfortunately, the ecological features of these species and their distribution remain entirely uninvestigated, and, apart from faunal data, only fragmental information on the habitats of individual species are available. The striking feature of this fauna is its richness and the presence of a considerable number of species not occurring in other parts of Siberia. Almost all the species are components of meadow type associations, but some are even closely connected with tree-shrub vegetation, e.g., Eirenephilus longipennis Shir. and certain other Podismini. The most typical species of this zone are Podismopsis ussuriensis Ikonn., Mongolotettix japonicus Bol., Chorthippus schmidti Ikonn., Haplotropis brunneriana Sauss., many Podismini, Clinotettix ussuriensis B.-Bienko, and others. We must also mention that species belonging to purely tropical genera occur there too, e.g., Oxya maritima Mistsh., Trilophidia japonica Sauss., and others.

The fauna of Sakhalin is poor in species and is representative of the fauna of broad-leaved forests However, as a result of the development of mountainous topography on this island, the possibility of finding species of the taiga type there
60 too is not excluded. As to the southern group of the Kurile Islands (Kunashiri and Etorofu), although their fauna is similar to that of the forests of the mainland, it has a single purely Japanese species—Parapodisma mikado Bol. and several, probably insular, endemic species (Podismopsis konakovi B.-Bienko, which is close to P. gelida Mir. of the East Siberian Plateau, Podisma kurilensis B.-Bienko, which is close to P. aberrans Ikonn., and others).

Within the limits of the forest region certain grasshopper species may be agricultural pests. Felling of forests leading to an increase in grasshopper numbers is the fundamental and decisive factor for the appearance of breeding foci of injurious species. Planting of agricultural plants on these plots exposes the plants to locusts and grasshoppers, and irrational grazing of cattle and backward farming methods in the past led to accumulation of these pests and made the situation more acute. Thus, for centuries the breeding foci of Locusta migratoria rossica Uv. et Zol. originated in the southern part of the mixed forest zone of the European part of Russia. Thus the foci of non-gregarious locusts and grasshoppers originated in the forest areas of Siberia and the Far East.

The steppe zone (including forest-steppe) extends from Moldavia and the southern Ukraine to Transbaikal. This zone has a rich and varied grasshopper and locust fauna, numbering more than 120 species and forming various associations. However, not more than one third of these species can be regarded as typical components of the steppe fauna, included in the composition of steppe cenoses, i.e., communities of angustifoliate, sod-forming, cereal grasses, while the remaining species inhabit azonal biotopes and are not typical of the steppes. The ecological associations of the grasshoppers of this zone are the most fully studied and are described in a number of papers (Bei-Bienko, 1930b; Bystritskii, 1933; Medvedev, 1928; Nefedov, 1932, 1936, 1939; Rubtsov, 1932b; Strakhovskii, 1935). The most distinctive components of typical feather grass-sheep's fescue steppes are: Euchorthippus pulvinatus F.-W., and species of the genus Stenobothrus Fisch., in particular St. fischeri Ev., Pararcyptera microptera F.-W. and Celes variabilis Pall., distributed from Moldavia to Transbaikal. With the increase of the role of mixed grasses in steppe plant communities, i.e., in depressions of the southern parts of the zone or toward the North, the Euchorthippus pulvinatus F.-W. disappears, and instead of Stenobothrus fischeri Ev., St. nigromaculatus H.-Sch., St. lineatus Panz., Arcyptera fusca Pall., species of the genus Chorthippus Fieb., in particular Ch. albomarginatus Deg., and others appear. The southern types of steppe which have wormwood in the grass stand are often densely inhabited by Calliptamus italicus together with Oedaleus decorus Germ. and others. Myrmeleotettix antennatus Fieb. is typical of the azonal biotopes of the southern steppe zone such as sandy hills; species of the genera Mesasippus Tarb. or Aeropedellus Heb. often found in addition to the above species in the Asiatic part of the U.S.S.R. The following association of grasshoppers, consisting of: Chorthippus longicornis Latr., Chrysochraon dispar Germ., Stauroderus scalaris F.-W., Tetrix subulata L., and others, is very typical of river valleys with rich cereal-mixed-grass meadows. Chorthippus albomarginatus Deg. is found in addition to the above species in the northern parts of the zone, and, where sedges are present, even Mecostethus grossus L., while in the southern parts of the zone the southern subspecies of Chorthippus dorsatus, Ch. dorsatus dichrous Ev. is found. The following association, inhabiting meadow-steppe areas on the margins of forest tracts, is typical within the limits of the forest-steppe zone. It consists of: Chrysochraon dispar Germ., Euthystira brachyptera Ocsk., Chorthippus longicornis Latr., Chorthip-
51 pus apricarius L., Stauroderus scalaris F.-W., Psophus

stridulus L., Podisma pedestris L., Arcyptera fusca Pall., and others.

The steppe zone is especially favorable for mass reproduction of grasshoppers, and a number of its typical species, namely Gomphocerus sibiricus L., Chorthippus albomarginatus Deg., Stauroderus scalaris F.-W., and other solitary species, as well as Calliptamus italicus, are known as dangerous pests of agricultural crops. Irregular grazing of cattle, the system of laylands, and backward farming methods were in former times environmental factors conducive to the accumulation of optimal habitats for grasshoppers, and under suitable weather conditions led to mass multiplication resulting in the destruction of crops, and subsequent hunger and impoverishment of the peasant population. At the present, advanced agrotechnics, based on knowledge of the eminent Russian scientists V. Dokuchaev, P. Kostychev, and V. Wil'yams and involving the introduction of proper arable grass rotation, and a wide development of field-protecting afforestation, has become the factor which will finally lead to complete extermination of locusts and grasshoppers as mass pests of cultivated plants in the steppe zone.

The desert zone (including the transitory semi-desert zone) has an even richer grasshopper fauna, consisting of not less than 150 species. However, in this case, as in the steppe zone, only part of the species are typically desert forms (not more than 40-50%), while the rest are typical of various azonal biotopes of the desert zone. The associations of the desert zone are not sufficiently elucidated in the literature, the only available data being on the transitory (semi-desert) zone of the Lower Volga Region (Predtechenskii, 1928b) and the Zaisan depression (Bei-Bienko, 1930b), as well as on deserts of the northern type within the limits of Kazakhstan (Bei-Bienko, 1949c) The grasshopper fauna acquires its typical traits in accordance with the features of desert cenoses, only a few species occurring in different types of deserts. To these belong, in the first place, Calliptamus barbarus Costa, which is one of the typical species of the desert zone in general.

Numerous species are native to rocky deserts, but the following ones are especially typical Helioscirtus moseri Sauss., certain Sphingonotus species, in particular Sp. octofasciatus Serv. and Sp. obscuratus Walk., several species of the genus Thrinchus F.-W., Metromerus coelesyriensis G.-T., and others, the very characteristic apterous Saxetania Mistsh appear in the southernmost parts of the desert zone, in the southern outlying areas of Middle Asia

Clay deserts with a salsola vegetation have their special fauna, which varies greatly depending on the features of the plant and soil covers Thus, within the limits of the northern variations of deserts, Sphingonotus salinus Pall. and Sph. halophilus B.-Bienko are typical of takyrs with a sparse salsola vegetation, while the vast desert areas under Atriplex canum (salsola) vegetation have their own association of locusts and grasshoppers, consisting, in addition to Calliptamus barbarus Costa, of Dericorys tibialis Pall., Notostaurus albicornis Ev., Sphingonotus halocnemi Uv. and other Sphingonotus species, Oedipoda miniata Pall., and others Diexis
62 Zub., living on salsolas, Sphingonotus satrapes Sauss., and others, appear within the limits of the southern variants of clay deserts with a salsola vegetation, but the composition of the locust and grasshopper associations remains unknown

Deserts situated at the foot of mountains and covered with ephemeral vegetation are typical of Middle Asia, southern Kazakhstan, and southeastern Transcaucasia and have an entirely different fauna. The vegetation cover there consists of ephemeral plants, which develop luxuriantly in spring and complete their development by the beginning of summer. Dociostaurus maroccanus Thunb. is the most common species in these deserts, being accompanied by D. tartarus Uv., as well as by a number of other species, varying in dependence on the geographical location of the area. For Middle Asia in particular, Calliptamus turanicus Tarb., Dociostaurus kraussi nigrogeniculatus Tarb., D. plotnikovi Uv., and others are very typical.

The sandy desert is distinguished by an extremely typical and very peculiar grasshopper fauna, not occurring beyond the limits of this type of desert. Grasshopper associations of hilly and ridgy sands are basically composed of typical psammobionts, namely, Hyalorrhipis clausi Ev., species of the genus Leptopternis Sauss., and certain typical species of the genus Thrinchus (Thrinchus arenosus B.-Bienko under the conditions of northern-type deserts, Th. desertus B.-Bienko together with Strumiger desertorum Zub. in southern-type deserts). Besides these, Ochrilidia hebetata Uv. is always found in sandy deserts, being closely connected with the plant Aristida pennata (Gramineae) and differing from the preceding species in being a typical chortobiont.

The valley landscapes of the desert zone are distinguished by increased moisture, and have their own specific fauna composed mainly of phytophiles, and distinctly differing from the typical desert fauna. Locusta migratoria, Tropidopola turanica Uv., Chrysochraon dispar Germ., species of the genus Aiolopus Fieb. are typical of reed-fields; Oxya fuscovittata Marsh. and Gonista sagitta Uv. are also found farther south, while Chrotogonus turanicus Kuthy, Paratettix uvarovi Sem., and Tetrix tartara Bol. live on sandy banks. The fauna of flood-plain forests of the Middle Asian type is very characteristic, the following species being common: Chorthippus turanicus Tarb., Ch. angulatus Tarb., Omocestus heymonsi Rme., Mesasippus kozhevnikovi Tarb., Acrida oxycephala Pall., and a number of other species. The latter, in the southern parts of the desert zone, are different from those in the northern parts, the species occurring on sandy banks in the preceding case, being found on banks in this case too.

Haloxylon brushwood, located mainly in depressions and often in those parts of valleys remote from the river-bed, have a mixed fauna which changes according to the location of the brushwood. Dericorys annulatus roseipennis Redt., living and feeding on Haloxylon, is the most typical species. Among others, certain species of the genus Sphingonotus Fieb., Mioscirtus wagneri Ev., and Egnatioides desertus Uv. occur if the Haloxylon brushwoods border or grow on saline soils.

63 The desert zone, like the steppe zone, is characterized by the presence of a diverse complex of injurious grasshopper species, but their specific composition differs in many respects. The role of gregarious grasshoppers —Locusta migratoria and Dociostaurus maroccanus — is especially important. The breeding grounds of the former are adapted to the landscape of banks with reed-fields, while the breeding-grounds of the latter are located exclusively in deserts with ephemeral vegetation. Both types of landscape are of great agricultural value, and are therefore widely

cultivated. This fact brings the crops closer to the pest's foci and creates a real danger of loss of yield and contributes to the ousting of the pest and curtailment of areas suitable for its life. The latter especially affects Dociostaurus maroccanus. In Middle Asia and southern Kazakhstan occur Calliptamus turanicus Tarb., Dociostaurus kraussi nigrogeniculatus Tarb., and other species typical of virgin deserts with ephemeral vegetation either together with Dociostaurus maroccanus or independently. The fate of the above species is to a certain degree similar to that of Dociostaurus maroccanus Tarb., as the reclamation of deserts leads to the extermination and dying out of these species. Calliptamus italicus, called the "Oasis feelered locust" in Middle Asia, is characterized by its adaptability to artificially irrigated territories, i.e., those in the immediate vicinity of man. This species inhabits old desolate alfalfa plots, waste grounds, laylands and boundary strips, sides of irrigation ditches, and other similar places, and is a dangerous pest to irrigation agriculture. However, proper land utilization and advanced farming methods are capable not only of restricting this pest, but can probably prevent entirely the damage inflicted on agricultural crops.

The sub-tropical forest zone in the U.S.S.R. is found only in low-lying parts of Transcaucasus· the Lenkoran and Colchis depressions This zone, undoubtedly, has its characteristic fauna and grasshopper associations, but these are as yet entirely unstudied. We can only indicate Aiolopus strepens Latr., Acrida anatolica Dirsh., and representatives of the tribe Pamphagini *occurring there, as being the most typical species.*

The upland landscapes of the U.S.S.R. vary greatly and are formed by the Carpathians, Urals, mountainous Crimea, the Caucasus, mountains of Middle Asia (including southern Kazakhstan), and the vast mountain ranges in Siberia from the Altai to the Pacific Ocean. Mountain-meadow locust and grasshopper associations together with Miramella alpina Koll., Omocestus viridulus L., Chorthippus montanus Charp., and others are very typical of the Carpathian Mountains, which extend partly into the western territories of the Ukraine. The description of the above associations is given in a paper by Chetyrkina (1950).

The Ural mountains were investigated only from the faunal aspect, and very inadequately at that Data on mountain grasshopper associations are entirely absent. Probably certain northern *species which got there as a result* of displacement of the natural zones southward, are the most typical of the Ural fauna species. Such representatives of the Polar fauna as Melanoplus frigidus Boh. and Podismopsis poppiusi Mir. are, therefore, found there.

The Crimean mountains are poor in specific grasshopper fauna, only the southern coast of the Crimea with its Mediterranean climate has a number of species which are usually absent in other parts of the European part of
64 U.S.S.R. There are no data on grasshopper associations and the vertical distribution of species. The following species are typical of the southern coast Tetrix depressa Bris., Stenobothrus miramae Dirsh., Aiolopus strepens Latr., Acrotylus longipes Charp., Anacridium aegyptium L., and Dociostaurus maroccanus Thunb., some of the enumerated species reach the northern border of the Crimean mountains (Stenobothrus miramae Dirsh and Dociostaurus maroccanus). Pararcyptera microptera F.-W. has been found on Yaila

The Caucasus has a rich grasshopper fauna consisting of more than 150 species, but some are arrivals from the steppe, desert, and sub-tropical zones. The fauna of the Caucasus mountains is rich in endemic genera and species. To these belong Pachypodisma Dov.-Zap. (2 species), Micropodisma Dov.-Zap. (2 species), Caucasippus Uv. (one species), Phlocerus F.-W. (4 species), and others. Among the endemic species belonging to widely-distributed genera, we can point out to Podisma uvarovi Rme., P. miramae Sav., P. satunini Uv., Stenobothrus werneri Ad., certain species of the genus Chorthippus Fieb., 2 relatives of Gomphocerus sibiricus L. (Gomphocerus sibiricus caucasicus Motsch. and G. armeniacus Uv.), a number of representatives of the tribe Pamphagini (Nocarodes daghestanicus Uv., Paranocaracris latipes Uv., Paranocaracris rubripes F.-W., Eunothrotes derjugini Ad., and others). The following group of northern species is very typical of the fauna of the Caucasian mountains: Omocestus viridulus L., Stauroderus scalaris F.-W., Arcyptera fusca Pall., Chrysochraon dispar Germ., Psophus stridulus L., and others.

Grasshopper associations of the Caucasian mountains and the vertical distribution of species have been studied very inadequately, and only fragmentary data, not giving us any idea on the fauna in general, are available. In particular the following species have been recorded for the upland meadows: Gomphocerus sibiricus caucasicus Mitsch., the local subspecies of Stauroderus scalaris F.-W., Chorthippus apricarius L., Omocestus viridulus L., Psophus stridulus L., species of the genera Phlocerus F.-W., Pachypodisma Dov.-Zap., Podisma Berth., and others. The complex of xerophilic mountain species inhabiting the dry uplands of Dagestan, Armenia, and other parts of the southern Caucasus is very characteristic. To these belong Pseudoceles sp. sp., a number of species of the genera Nocarodes F.-W. and Nocaracris Uv. In the vicinity of the above species, in upland steppes, special grasshopper associations are formed by arrivals from the steppe zone: representatives of the genera Stenobothrus Fisch. (St. nigromaculatus H.-Sch., St. lineatus Panz., and others) and Omocestus Bol. (O. petraeus Bris. and O. haemorrhoidalis Charp.).

The mountains of Middle Asia and southern Kazakhstan are also distinguished by a rich fauna with its own characteristic features. First of all there are a considerable number of endemic genera: Conophyma Zub. (more than 60 species); Bienkoa Mistsh. (one species); Plotnikovia Um. (one species); Saxetophilus Um. (one species); Phytomastax B.-Bienko (6 species); Gomphomastax Br.-W. (9 species); Climomastax B.-Bienko (one species); and others. A considerable number (more than 20) of endemic species, belonging to so widely distributed a genus as Chorthippus Fieb., are also known, individual endemic species belong to the genera Stenobothrus Fisch., Bryodema Fieb., Sphingonotus Fieb., and others. The associations of this fauna are little studied and only partially described for the Ketmen range in northeastern Tien Shan (Bei-Bienko, 1949b) and for part of the northern slopes of the Turkestan Range (Davletshina, 1948).

65 Perhaps the most typical feature of the fauna of high mountain meadows on the ranges of Middle Asia and southern Kazakhstan is the presence of

species of the genus Conophyma Zub and often of the genus Chorthippus Fieb. in association with certain common species from lowland meadows and steppes of the European part of the U.S.S.R. and western Siberia. Representatives of the genera Gomphomastax Br -W or Phytomastax B -Bienko sometimes occur in addition to the above complex of species, but these usually occupy other habitats, namely, juniper brushwood, plots with wormwood shrubs, etc , and keep to these plants Another typical feature is the strongly pronounced specific endemism, in particular in the genus Conophyma Zub , usually every large mountain range or system of ranges connected with each other has one or two species, not occurring elsewhere This feature is less pronounced in the genus Chorthippus Fieb and in the above-mentioned representatives of the subfamily Gomphomastacinae

Associations of species inhabiting Alpine and subalpine meadows can serve as examples of high mountain grasshopper associations Cobresian Alpine meadows (with the participation of a specific sedge of the genus Cobresia), widely distributed in the Tien Shan, have the following species composition in the northeastern Terskei Ala Tau (2,800-3,000 m absolute altitude) Conophyma almasyi rugosum Mistsh , Conophyma przewalskii B -Bienko, Chorthippus kuznetzovi B -Bienko Gomphocerus sibiricus turkestanicus Mistsh and Omocestus haemorrhoidalis Charp The subalpine mixed-grass meadows situated at a lower level, are also inhabited by species of the genus Conophyma Zub , but are devoid of the local representatives of the genus Chorthippus Fieb and are enriched by such northern lowland species as Stauroderus scalaris F -W , Chorthippus apricarius L , Omocestus viridulus L , and often Gomphocerus sibiricus L and Omocestus haemorrhoidalis Charp Besides Conophyma almasyi rugosum Mistsh and Gomphocerus sibiricus the presence of the endemic brachypterous Stenobothrus cobresianus B -Bienko is typical of Alpine cobresian meadows of the Ketmen Range The latter, however, strongly resembles upland Middle Asian species of the genus Chorthippus Fieb in appearance and ecologically The former two species inhabit more arid and rocky plots, usually high juniper vegetation, on the Ketmen Range and Dzungarian Ala Tau and occur there together with representatives of the subfamily Gomphomastacinae

High mountain plots with a rich cover of small stones and xerophytic vegetation are inhabited by xerophilic locust and grasshopper associations Calliptamus italicus Stenobothrus eurasius Zub , Oedaleus decorus Germ and other species, with the participation either of representatives of the genera Bryodema Fieb , Sphingonotus Fieb , and Pseudoceles Bol or of the subfamily Pamphaginae, in dependence on the geographical location of the range

Certain species of the genus Conophyma Zub (C jakovlevi B -Bienko C umnovi B Bienko, and others) Bienkoa fedtshenkoi Zub , certain Chorthippus Fieb —and also the local subspecies of Pararcyptera microptera—Pararcyptera microptera turanica Uv — Ramburiella turcomana F -W , and others have been recorded as pests of agricultural crops in the mountains of Middle Asia

The characteristic features of the upland fauna of the Tarbagatai Range, situated between the Tien Shan part in the south and the Altai part in the north have been inadequately studied and only that of the eastern part of

the range (Saur). This fauna resembles that of the West Siberian plateau in its fundamental features, but has among its species a local brachypterous species of the genus Chorthippus Fieb. (Ch. uvarovi B.-Bienko), which belongs to the Middle Asian group of species and has no relatives in Siberia. Besides that, Bryodema zaisanicum B.-Bienko occurs, which is also native to Chinese Dzungaria, and is the closest relative of Bryodema semenovi Ikonn. of the northeastern Tien Shan.

The fauna of upland parts of Siberia has been studied very inadequately. The available faunistic data have no common ecological foundation and do not provide sufficient information for the understanding of characteristic features of the distribution of species in the area. The fauna of the Altai mountains is an exception, as it has been studied with regard to ecological associations of species. This fact enables us to understand certain peculiar features of the distribution of species in other parts of upland Siberia. The presence of Melanoplus frigidus Boh. is typical of the Alpine belt of all the upland parts of Siberia; Podismopsis altaica Zub. invariably occurs in the Alpine belt of the Altai, and Gomphocerus sibiricus in its southeastern parts. The rich mixed-cereal-grass upland meadows of the Altai are inhabited by an association of species consisting of such widely-distributed species as Omocestus viridulus L., Chorthippus apricarius L., Chrysochraon dispar Germ., Euthystira brachyptera Ocsk., and Stauroderus scalaris F.-W., but Podismopsis poppiusi Mir. and Siberian species, such as Chorthippus intermedius B.-Bienko and Ch. aethalinus Zub., are also found in addition to the above species.

Steppe grasshopper associations of the Altai mountains are well represented in their central and southeastern parts, e.g., along the river Katun and its tributaries.

The most common species of these associations are: Gomphocerus sibiricus, *Stenobothrus eurasius* Zub., *Pararcyptera microptera altaica* Mistsh., Bryodema tuberculatum dilitum Stoll, as well as Podismopsis altaica Zub. and Myrmeleotettix palpalis Zub. The latter two species are absent in the plains of Western Siberia, and give a special character to the steppe associations of the Altai mountains, typical of the steppes of Eastern Siberia, including probably the upland steppes. The high mountain Chuya steppe, situated at an altitude of 1,700 m, represents an outpost of the cold Mongolian desert, and is inhabited by a special Mongolian form of Bryodema—Bryodema gebleri mongolicum Zub. The relatives of this *Bryodema species*, *Br. holdereri Krauss* and Br. luctuosum Stoll, are distributed in Mongolia and are typical inhabitants of small-stone-covered, bare slopes in southern Transbaikal and certain other places in Siberia.

The East Siberian plateau in the Yana, Indigirka, and Kolyma river basins has within its fauna, besides the widely-distributed Melanoplus frigidus Boh. and Tetrix fuliginosa Zett., such endemic species as Podismopsis gelida Mir. The following steppe species penetrate there from the south: Gomphocerus sibiricus, Aeropedellus variegatus F.-W., and Bryodema tuberculatum dilutum Stoll, which apparently stay on dry rocky slopes. Certain of these species (Melanoplus frigidus Boh., Gomphocerus sibiricus, Aeropedellus variegatus F.-W., and *Primnoa polaris* Mir.) penetrate into Kamchatka too. The upland territories of the Far East in the basin of the

middle and lower courses of the Amur River (Little Khingan, Sikhote Alin)
67 as well as the system of mountain chains of the Stanovoi Range, situated approximately in the watershed of the rivers Amur and Lena, and the Aldan Range adjacent in the north, have been studied very inadequately even from the point of view of fauna. We are therefore unable to characterize the fauna for this vast upland territory, as only individual species are known, without any data on their ecology and distribution in the area. Species of the genus Podismopsis Zub. and of the group Podismini are probably widely distributed there, in particular Podismopsis ussuriensis Ikonn. and Primnoa specialis Mistsh. are known to occur in the Sikhote Alin range, the latter perhaps being an endemic species there.

These are the most important characteristic features of the locust and grasshopper fauna of different areas of the U S. S. R.

ECONOMIC IMPORTANCE

Locusts and grasshoppers are ancient enemies to agriculture and long ago attracted man's attention. The most ancient relic of the past depicting a locust is, apparently, the picture (in color) painted on the wall of a tomb dating back to the epoch of the 12th dynasty of Egyptian Pharaohs, i.e., approximately to the year 2400 B.C (Porchinskii, 1914). The first data about mass reproduction of locusts and grasshoppers and devastation caused by them deal with Egypt, Libya, and Palestine and date back to the years 1490-904 B.C. Similarly, there are data on devastation and hunger caused by locusts in Ancient China, Armenia, Syria and Mesopotamia. The first data on locusts in Europe date back to the years 552 and 553 A.D., and in Russia to 1008 A.D †

Mass grasshopper outbreaks in Russia (i.e., the complex of species consisting of Locusta migratoria, Calliptamus italicus, and non-gregarious locusts and grasshoppers) are repeatedly mentioned in historical documents pertaining to the Middle Ages and the beginning of modern times Isolated records in the press (e.g., in the Moscow newspaper 'Vedomosti' of 1712) and special publications about grasshoppers appeared as early as the 18th century.

However the increasing importance of locust and grasshopper pests, connected with the increase of cultivated areas in the steppe regions and the transition of Russia to a capitalistic form of development, persistently demanded the finding of control measures for the protection of crops Consequently, a considerable number of articles, notes, and even books, dealing not only with instances of occurrence of these pests, but with peculiar features of their biology and methods of their control, appeared during the 19th century, especially during its second half. In particular, a popular booklet, excellent for those times, by Mochul'skii ("On Locusts and Methods of their Control") appeared in 1853, as well as the fundamental summary by Keppen (1870), where all knowledge on locusts was summarized, the

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† Russian Chronicle after Nikon's record, SPb , 1767 'in the same year there was a multitude of locusts' quoted after Keppen, 1870, where the above-mentioned data also appear.

author quoting numerous literary sources, including about 60 papers published in Russia. The number of publications dealing with grasshopper pests, excluding the publications quoted by Keppen, reached 305 in 1902 (Jakobson, 1905).

In spite of the special attention paid to grasshoppers as pests of agricultural crops, hay fields, and pastures, the control of the pests was based almost entirely on different mechanical methods (collection, crushing, driving into ditches, etc.); until the end of the 19th century, biological methods (taking of poultry and pigs to the infested areas) or plowing of the egg-pod deposits were seldom applied. There was no question of applying real agrotechnical methods, although even then progressive thinkers emphasized the importance of the reclamation of virgin lands and the application of better farming methods for the control of these pests. This is illustrated by the suggestions appearing in papers by Mochul'skii (1853), Keppen (1870), and, especially, Nosov (1893).

Such inadequate control measures led to enormous losses in agriculture at the end of the 19th century and the beginning of the 20th century. Thus, according to data by Shtumpf, 116,950 hectares of grain crops, which made up 47% of the cultivated area, were ruined by non-gregarious grasshoppers in the Shadrinsk District of the former Perm Province (now the Kurgan Region) in 1891; according to data by the famous agricultural worker Skalozubov, 164,850 hectares, i.e., one-third of crops were affected and ruined in the former Tobolsk Province in 1901.

At the end of the 19th century, with the success of chemistry, certain chemical methods of control (such as spraying with stomach poisons) were worked out and began to be put into practice. The method of poison baits, worked out and improved in many details with the considerable participation of Russian scientists, played an especially important role, and was applied on a wide scale already in 1923 over an area of more than one million hectares, helping to save at least 4 million centners of the U.S.S.R. harvest.

Aerial chemical control was a major step forward. This method originated in the U.S.S.R. as far back as 1921, the first experiments being conducted at the beginning of 1922. The wide practical implementation of this method was due to the efforts of a number of Russian scientists and engineers (V. Boldyrev, G. Korotkikh, P. Sviridenko, et al). The aerial chemical method in the form of dusting with stomach poisons was applied in the control of locusts and grasshoppers already in 1925 over an area of 2544 hectares, and in 1931 over an area of 01.4 thousand hectares. The new method of aerial broadcasting of poison baits was finally worked out and put into practice in 1931 (Bei-Bienko, 1932c), and this method was, as early as 1934, applied over an area of more than 100 thousand hectares, and, in combination with aerial dusting, over an area of 351.1 thousand hectares. The method of aerial spraying was put into practice at the beginning of the forties, although it was tested in the U.S.S.R. for the first time in 1922 (for more details on aerial chemical control of grasshoppers see Rukavishnikov, 1950). A new method of control has been proposed recently: treatment of locust and grasshopper concentrations with baits wetted in a culture of pathogenic microorganisms. This method leads to the death of part of the locusts and grasshoppers and to sterilization of the surviving specimens (Vinokurov, 1948b).

Grasshopper control in the U.S.S.R. is implemented at present by wide application of various methods of aerial chemical control and the usual method of poison baits, with the indispensible condition of a thorough preliminary exposure of all the infested areas, according to the egg-pod deposits, which are surveyed and ascertained at the end of summer or in the fall. These perfect methods of chemical control and also the progress in research on the biology of grasshopper pests, done by a number of Soviet scientists (L. Zakharov, L. Zimin, E. Ivanov, V. Nikol'skii, V. Plotnikov,
9 I. Rubtsov, S. Predtechenskii, P. Sviridenko, et al), permitted a reduction of agricultural losses caused by these pests in the U.S.S.R. in general to insignificant proportions, so much so that even in 1935, the treatment in Middle Asia and eastern Transcaucasus of 139 thousand hectares of cotton infested by Dociostaurus maroccanus, resulted in the loss of only 30 hectares of the crop. The progress in agrotechnical methods of grasshopper control is also due to the radical reconstruction of agriculture, namely, the organization of kolkhozes, which resulted in the liquidation of the overlapping of agricultural lands and boundary-strips that served as breeding foci for the grasshoppers, and ensured a general improvement in the agricultural routine. At present the danger of destruction of crops by grasshopper pests can be reduced to a minimum, provided the control measures are applied properly and in due time. Regular and thorough surveys of the condition and numbers of these pests are necessary in order to arrest the outbreak at the very beginning, before it becomes a natural disaster, and to destroy immediately those locust and grasshopper swarms which have appeared. This is especially important with regard to gregarious grasshoppers because their foci are remote from populated areas and are often difficult to access, and when the grasshoppers are allowed to leave their foci and penetrate into a cultivated area, the damage that may be inflicted on crops is difficult to prevent under these conditions.

Thus, the scientific and practical efforts have turned grasshopper control in the U.S.S.R. into an effective undertaking, the success of which depends on the regular application of the system of surveys and control measures (under the ever-increasing role of agrotechnical measures restricting the distribution of locusts). The above measures will remain essential until the reconstruction of nature and agriculture leads to a final extermination of the pest.

The injurious grasshopper species in the U.S.S.R. are numerous and varied, their list, compiled in 1932, numbered 67 species (Bei-Bienko, 1932b), and by 1949, the number of recorded species reached 59 only for Middle Asia and southern Kazakhstan (Mishchenko, 1949b). On the basis of the above data, and taking into consideration a number of biological features of grasshoppers, we can state without exaggeration that many species inhabiting the U.S.S.R. are capable of damaging plants of economic value. In particular the above-mentioned lists of injurious species may be increased by adding species not previously recorded as pests, which are found during the initial stages of reclamation of new territories or, sometimes, when new agricultural crops are introduced. However, only a few species, not more than 10-12 of the above list, may be considered especially dangerous. Some other species represent the group of secondary pests of local or temporary importance, while the remaining majority form the third group of species, which never appear en masse and damage cultivated plants seldom and in individual cases only.

At present, injurious locust and grasshopper species remain serious agricultural pests in certain areas of the U.S.S.R., in particular where vast virgin or inconvenient lands are still left. The damage caused by grasshoppers is revealed not only in the possible injury to crops, but also in the decrease in productivity of natural pastures and hay lands, a fact that is often not taken into consideration. We must also not forget that the present sharp decrease in the amount of damage inflicted by grasshoppers is the result of persistent and methodical control, which should not be
70 slackened for some time to come. Population growth, expansion of the area under crop, and a further improvement in the farming methods—a general introduction of grass-arable-crop rotation, construction of canals and reclamation of deserts, a wide application of field-protecting afforestation and rationalized grazing, will all have a decisive effect on natural conditions and ensure a complete dying-out of species injurious to agricultural lands. The great Stalin plan for the reconstruction of nature, widely put into practice in the U.S.S.R., plays a decisive role in this respect.

The distribution of injurious grasshopper species in the U.S.S.R. has its regular pattern, typical of each individual species, and represents their specific properties. It follows, naturally, that the territories where the species appear as pests, i.e., the zones of their harmful activity, are also typical of each species. An attempt to reduce all this variety to a limited number of harmful zones involves certain difficulties, but may be useful for becoming acquainted with the structure and peculiar features of territories where grasshoppers may be of considerable importance. In accordance with the above we give a review of the zones of harmful activity of the main injurious grasshopper species in the U.S.S.R. In view of the fact that gregarious grasshoppers are distinguished by a number of specific traits, they are examined separately from the non-gregarious species.

Gregarious species in the U.S.S.R. include: Locusta migratoria L. and Dociostaurus maroccanus Thunb., but the third species, Schistocerca gregaria Forsk., may also be present. In certain cases Calliptamus italicus L. and Calliptamus turanicus Tarb. also possess gregarious habits, but it is more convenient to examine these species together with non-gregarious grasshoppers. Gregarious grasshoppers are characterized by their connection with definite territories, where the mass multiplication of a particular species is possible, these territories being distinguished by their peculiar physico-geographical features and called breeding-grounds. The ability of gregarious grasshoppers to make flights for long distances makes possible their flying beyond the limits of breeding-grounds, which is often accompanied by damage to crops and the formation of temporary breeding-grounds. The breeding areas and areas of harmful activity, therefore, do not always coincide in gregarious grasshoppers.

Locusta migratoria L., represented in the U.S.S.R. by two subspecies, is the most widely-distributed gregarious species in the U.S.S.R. Locusta migratoria migratoria L. is the principal subspecies, and is native to the southern part of the U.S.S.R. within the limits of the desert zone and partly in the steppes. The breeding-grounds of this species are located in marshy reed-covered meadows, and situated in lowlands adjacent to river banks and shores of lakes and seas the (the lower reaches of the rivers Kuban, Terek, Volga, Ural, Syr Darya, Amu Darya, Ili, and others;

coasts of the Caspian and Aral seas and of the lakes Balkhash, Alakul, Zaisan, and others). Another subspecies, the Locusta migratoria rossica Uv. et Zol., is distributed farther north and inhabits sandy areas in the south of the forest zone of the European part of the U.S.S.R.; this subspecies does not make distant flights, and outbreaks occur considerably less often than in the case of Locusta migratoria L., usually after considerable intervals of time (after two to three hot and dry years).

71 Dociostaurus maroccanus Thunb. is distributed within the limits of loess deserts with ephemeral vegetation; these surround the mountain systems of southern Kazakhstan, Middle Asia, and the eastern Transcaucasus, and are in the steppe zone of the Ciscaucasus, southern Crimea, and sometimes the southern Ukraine and Moldavia, where habitats are located on the remainder of virgin lands used as pastures. Mass multiplication is regulated mainly by moisture conditions during the spring period, an excess, as well as a lack of moisture being unfavorable for breeding in the desert zone, while a lack of moisture and an excess of heat create conditions favorable for breeding in the steppe zone.

Schistocerca gregaria Först. is a native of the sub-tropical belt of Africa and southwestern Asia (Arabia, southern Iran, western India).

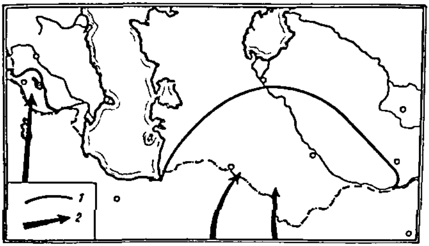

Figure 38. Borders of possible intrusion of Schistocerca gregaria (Först.) into the U.S.S.R. (According to Predtechenskii, with supplements)

1—northern border; 2—flight routes of locust swarms.

It cannot exist over a long period of time in the U.S.S.R., but may penetrate there during certain years, when it reaches the south of Middle Asia and the southern Transcaucasus (Figure 38). The locusts arrive from southwestern Asia during their mass-breeding years and, according to Predtechenskii (1935b), their flight takes place along definite flight routes within the territory of Iran (Figure 39). These flight routes are: 1) the Hari Rud route, which starts from Iranian Baluchistan, passes through the western edge of the Seistan depression and farther along the middle course of the river Hari Rud, which opens into the Kara Kum desert in southeastern Turkmenia,

2) the Sabzawar route, which begins with two branches from Makran in southeastern Iran, one which skirts the desert Dasht-i-lut from the east, while the other skirts the desert from the west, both uniting at the northern border of this desert, but dividing again into 3 branches, the middle branch passing through Sabzawar and farther in the Kopet Dag opening into the Kara Kum desert in southwestern Turkmenia; 3) the Samnan route is an extension of the western branch of the Sabzawar route in the northwestern direction, and reaching the Elburz mountains in northern Iran, having no outlet into
2 the U.S S.R.; 4) the Urmia route, begins from the Persian gulf, passes along the western edge of Iran until the depression of Lake Urmia (Rizaiyeh) in Iranian Azerbaijan, and reaches as far as the southern Transcaucasus within the limits of the Nakhichevan A.S.S.R. The average flight speed of swarms when advancing is usually 10-13 km per 24 hours. The swarms of yellow (sexually mature) locusts apppear on the territory of the U.S.S.R. at the beginning to the middle of May, but their intrusion may continue till the end of the first 10-day period of June. The egg-laying starts with the arrival of the first swarms, the eggs develop without a diapause, and the hatching of larvae takes place approximately 15-20 days after the beginning of egg-laying. Wings are acquired from the beginning of July until the third 10-day period of July, but this is also possible at the very end of June. Some of the winged, sexually immature (rose) specimens fly south into Iran; some die, not being able to spend the winter in the conditions of the southern U.S.S.R. On the basis of data on localities and dates of appearance of a considerable number of swarms, and considering the distance to the U.S.S.R. border, forecasts of probable intrusions of locusts into the U.S.S R can be made approximately a month before their actual appearance. New data on the biology of this species were received by N. Shcherbinovskii, but are as yet unpublished.

Figure 39. Sketch of flight-routes of sexually mature Schistocerca gregaria (Fõrsk.) in Iran. (According to Predtechenskii)

A—highland areas over 1,500 m above sea-level, B—flight-routes, I—Hari Rud route, II—Sabzawar route, III—Semnan route; IV—Urmia route.

Non-gregarious grasshoppers are unable to make mass flights and, therefore, inflict damage only within their zone of harmful activity. These zones partly coincide with the corresponding zones of Calliptamus italicus and Calliptamus turanicus Tarb., and are therefore examined together, although the gregarious state and flights of swarms are sometimes observed in the above two species. The main zones of harmful activity of non-gregarious grasshoppers, together with C. italicus and C. turanicus Tarb., are as follows:

1. The zone of northern solitary grasshoppers, which includes the forest-steppe and the adjacent northern steppe sub-zone in Siberia, the Ural Region, and northern Kazakhstan The main injurious species are Gomphocerus sibiricus, Staurodcrus scalaris, Chorthippus albomarginatus Deg , and in some parts Pararcyptera microptera F.-W

2 The steppe-zone of Calliptamus italicus which embraces a considerable part of the Kazakhstan steppe and enters the Altai Territory in the east, and into the south of the European part of the U S S R extends up to the Moldavian S S R The main injurious species is Calliptamus italicus, but in some places, in addition to it, there may be some other harmful species, namely, Dociostaurus kraussi Ing. in Kazakhstan, Pararcyptera microptera F -W , and others

3 The zone of grasshoppers affecting young dry-farmed crops in Middle Asia and southern Kazakhstan, includes the foothill loess deserts and dry steppes from the northern foothills of Kopet Dag to the northern foothills of Tien Shan The main injurious species are· Calliptamus turanicus, and Dociostaurus kraussi nigrogeniculatus Tarb., in some places harm is done by Ramburiella turcomana F -W., by the local subspecies of Pararcyptera microptera—Pararcyptera microptera turanica Uv., and by Oedaleus decorus Germ a part of the mentioned species often inflict harm together with Dociostaurus maroccanus

4 The zone of 'Oasis feelered locusts" includes the cultivated irrigated areas of Middle Asia and southern Kazakhstan Calliptamus italicus is the main harmful species, and inhabits, within the oases, old alfalfa plots, laylands, vacant lands, boundary areas, sides of irrigation ditches and roads

The described zones of harmful activity of grasshoppers can change, and with the reclamation of new areas and reconstructive advanced farming methods widely put into practice in the U S S R , will change even more and become curtailed

SYSTEMATICS AND CLASSIFICATION

Locusts and grasshoppers were for a long time considered by taxonomists as a separate family — Acrididae, of the order Orthoptera, together with such families as Blattidae, Mantidae, Phasmidae, Gryllidae, and Tettigoniidae The first three families were often united into a suborder of Cursoria, in contrast with the suborder Saltatoria However, many authors have long considered the first three 'families ' as independent orders, and consider the group Saltatoria a separate order This point of view is the most scientific and well-founded, although even in our times there are certain taxonomists, mainly experts on this group of insects, who continue to consider these diverse groups as families of a single Orthoptera order That this simplified interpretation of such a complex of insects is not correct is proved by the long-standing fact that both groups Saltatoria and Blattidae, have existed as independent branches of insect development since the Carboniferous period A number of prominent

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taxonomists such as A. V. Martynov, who have studied and worked out the classification of insects in general even consider the above-mentioned two orders as superorders.

As to the systematic rank of the grasshopper group, two points of view exist, excluding the outmoded tradition of considering grasshoppers as a single family. According to one of the above points of view, grasshoppers constitute a special suborder. According to another point of view, they constitute a special superfamily, which, together with the superfamily
74 Tridactyloidea, make up a special suborder Caelifera, in contrast with the suborder Ensifera, which includes the superfamilies Grylloidea and Tettigonioidea; the latter point of view is also adhered to by these authors.

The grasshopper superfamily is subdivided into the following 5 families: Tetrigidae, Eumastacidae, Acrididae, Proscopiidae, and Pneumoridae. The first 3 families are of a wide geographical distribution—they are found in all the parts of the world—and are examined in the present book; the remaining 2 families are of a limited distribution: Proscopiidae—in South America and Pneumoridae—in South Africa. The above two groups of families, besides the number of morphological differences between them, sharply differ also in the presence or absence of Brunner's organ, located, as has already been mentioned, on the ventral aspect of the hind femurs. The presence of this organ is typical of the families Tetrigidae, Eumastacidae, and Acrididae, while its absence is typical of the remaining 2 families; this is probably a primary feature and reflects the ancient differentiation of these two groups of families.

All the 3 families having Brunner's organ differ distinctly from each other in a number of other features described below in the special part. The family Tetrigidae can be contrasted with the families Eumastacidae and Acrididae together, in structure of the pronotum, wings, male copulatory apparatus, the number of tarsal segments on the fore- and mid-legs, and others. Tarbinskii (1940) used these facts as a basis for dividing the grasshoppers into two series: Acrydiiformes consisting of the single family Tetrigidae (previously called Acrydiidae) and Acridiformes consisting of the remaining families. At the present we do not accept these two series, as there are very important differences between the families Eumastacidae and Acrididae, such as absence of the tympanic organ, the presence of a special organ on the antennas, and other features peculiar to the family Eumastacidae, which the Acrididae family does not have.

Of these 3 families, the family Acrididae is the most interesting and complicated from the classificatory point of view. Certain contemporary authors, in particular Tarbinskii (1940), considered it necessary to subdivide this family into four independent families: Acrididae, Batrachotetrigidae, Pamphagidae, and Pyrgomorphidae. It is doubtful whether this method has serious scientific grounds because all these grasshoppers are a single interrelated complex of subfamilies without sharp differences and connected by transitions with each other.

Roberts (1941) made an attempt to divide all the family into two groups of subfamilies, in which the structure of the male copulatory apparatus differed. The group Chasmosacci (subfamilies: Pyrgomorphinae, Pamphaginae, Batrachotetriginae, and Thrinchinae) is distinguished by a more "primitive" copulatory apparatus, the ejaculatory duct of which has a large uncovered sac-like expansion (saccus ejaculatorius) not markedly separated from the

saccus spermatophorus, while the group Cryptosacci (subfamilies Catantopinae, Acridinae, Oedipodinae, and others) is distinguished by the presence of a well-separated but small saccus ejaculatorius in the ejaculatory duct Uvarov (1943c) proved that this subdivision is not as clear-cut as considered by Roberts, the subfamily Pyrgomorphinae, in particular, has transitory
75 features At the same time, the structure of the copulatory apparatus is a good identification feature for different subfamilies, but the 3 principal subfamilies Chasmosacci (Pamphaginae, Batrachotetriginae, and Thrinchinae), according to their characteristics, including the male's copulatory apparatus, represent a single complex making up only one subfamily Pamphaginae

With regard to other characteristics of the family Acrididae, the group Egnatii is considered by us not as an aberrant component of the subfamily Oedipodinae, but as an independent subfamily Egnatiinae, which is closely related to Catantopinae The above consideration was based on the following facts a) weakly-developed or absent false median vein of the tegmina is typical of the Egnatiinae, while in the subfamily Oedipodinae the well-developed false median vein is a leading morphological feature, connected with the biology of stridulation, and is a typical feature of this subfamily, b) the presence in Egnatiinae of a peculiar structure of the ventral side of the thorax, and the tendency to the formation of transverse rugae on the lateral sides of the abdomen, which is, perhaps, a part of the chirping apparatus, c) the presence of glandular sacs on the lateral sides of the genital cavity of the female Catantopinae (Slifer, 1939 and 1940) and their absence in typical Oedipodinae, d) peculiar features of anatomical structure of the anterior part of the alimentary tract (Bryantseva, 1950b)

As to the families Tetrigidae and Eumastacidae which are mainly tropical groups and are represented in the U S S R by only a small number of species, we must point to the entirely unsatisfactory classification of the former one, i e , of the family Tetrigidae, the subdivision of this family into subfamilies is artificial and requires revision, particularly the subfamilies Scelimeninae, Metrodorinae, and Tetriginae However, revision of the classification of this family is possible only on the basis of the study of considerable material from the tropical zone, which is beyond the scope of the present book

All the locust and grasshopper families and subfamilies examined in this book are arranged in the following order

1) family Tetrigidae subfamilies Cladonotinae, Scelimeninae, Metrodorinae, and Tetriginae,

2) family Eumastacidae subfamilies Erianthinae, Episactinae, Gomphomastacinae, and Eumastacinae,

3) family Acrididae subfamilies Catantopinae, Pyrgomorphinae, Pamphaginae, Egnatiinae, Acridinae, and Oedipodinae

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A summary of the papers by Shumakov and Yakhimovich (1950) and Yakhimovich (1950) is already elucidated in the present book (see part I, page 29), the error of the assertion about the absence of the embryonic diapause in the solitary phase of Locusta migratoria, is once more pointed out (compare with the note to the article by Znamenskii, 1951).

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The question of species independence of gregarious and solitary phases of Locusta migratoria is once more discussed, but with the provision that these species are capable of transforming from one to another. The above author does not confirm this point of view by new experimental data, and bases his argument on an erroneous understanding of certain peculiar features of the biology of Locusta migratoria. His ideas, in contrast to his assertion, contradict Academician T. D Lysenko's Theory of Species, as he does not take into account the following facts concerning the biology of Locusta migratoria L.: 1) the phases often occur together and under similar conditions (e.g., specimens of the solitary phase are often found at the end of a band of gregarious ones), and never and nowhere do they occur in competitive interrelation; 2) the phases easily pair with each other and produce a fertile progeny, 3) specimens are capable of a prompt transformation from one phase to another during ontogenesis or even during part of it, i.e., are capable of deviating from their definite specific qualities, thus differing from true species, 4) the newly-formed phase is not capable of entirely ousting the primary phase from the range, while "under natural conditions....., the conceived species reproduce quickly and entirely oust the parent species from the given areal" (Lysenko, 1950, Doklady Vsesoyuznoi Akademii Sel'skokhoz. Nauk imeni Lenina, 11:11). We have already pointed out (see part I, page 36), that phases of locusts and grasshoppers are specific forms of existence of the species, and cannot be considered as independent or arising species. The ability of gregarious grasshoppers to form either a gregarious or a solitary phase under natural conditions, is an example of polymorphism and adaptive variability of species.

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87. Zakharov, L.Z. Massovye razmnozheniya aziatskoi saranchi i ikh prognoz (Mass-breedings of Locusta migratoria and their Forecast). —In: Vtoraya Ekologicheskaya Konferentsiya, Tezisy Dokladov, 1:75-77, Kiev. 1950.

88. Zimin, L.S. K izucheniyu biologii i ekologii bogarnogo prusa v Srednei Azii (Study of the Biology and Ecology of Calliptamus turanicus Tarb. in Middle Asia). —In: Saranchevye Srednei Azii, Sbornik Statei, pp. 82-112, Tashkent. 1934.

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It is once again confirmed that the developing egg of Locusta migratoria L. requires a drop in temperature in order to end the diapause (see part I, page 27), but this feature applies only to the gregarious phase, absence of the embryonic diapause in the solitary phase is conducive to the death of most of the eggs during overwintering. The formation of the gregarious phase is explained by the development of the larvae at a temperature not exceeding 18°C, and not by the interactions of specimens living in congestion. Unfortunately, in so concise a description certain theses of this undoubtedly interesting paper remain incomprehensible or insufficiently proved.

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The possibility of egg-laying on plots with denser vegetation and a clay soil is indicated for southern breeding-grounds of Locusta migratoria L. (e.g., in the lower reaches of the River Amu Darya) in hot weather, while in cool weather, at a later date (e.g., in September), or in the northern breeding-grounds (in the Kuban), egg-laying takes place on plots with a sparser plant cover, and often on sandy soils The difference in the ecology of egg-laying in the north of the range and under the conditions of Middle Asia once again confirms the rule of zonal change of habitats, see part I, pp. 41-43.

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† [See footnote on p. 135.]

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SPECIAL PART

Key to Families

83

1 (2). Pronotum extended caudad into a long process, covering abdomen from above (Figure 58). Tarsi always without an empodium between the claws . . . . I. Tetrigidae (p. 83).

2 (1). Pronotum short, not covering abdomen from above. Tarsi usually with distinct empodium between claws, more seldom weakly pronounced.

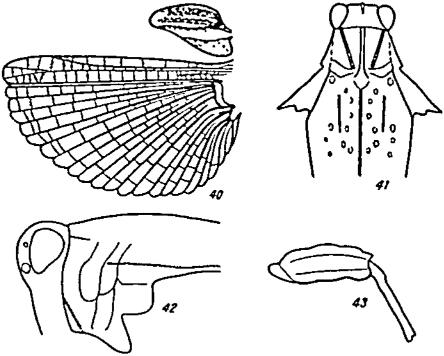
3 (4). Antennae shorter than anterior femora, if longer, then the first segment of the hind tarsus is serrated dorsally, and the body entirely apterous. Bases of antennas spaced at least a little more than lateral ocelli (Figures 70, 86). No tympanic organ on sides of first abdominal segment. . . . . II. Eumastacidae (p. 112).

4 (3). Antennae longer than anterior femora, the first segment of the hind tarsus not serrated dorsally. Bases of antennae spaced less than lateral ocelli, or the sides of the first abdominal segment bear a tympanic organ; both features are often marked . . . . III. Acrididae (p. 134).

1. Family TETRIGIDAE (=ACRYDIIDAE)

(Compiled by G. Ya. Bei-Bienko)

Body small, with earthy tinges. Head short, the frontal ridge having a furrow or being strongly widened above the median ocellus, beneath the ocellus having the shape of an unpaired carina, which is bipartite angularly at the clypeus (Figure 5). Antennae are 9-22 segmented, but in the majority of genera consist of 13-15 segments (Figures 53-55). Pronotum very long, produced posteriorly into a process. and covering the abdomen entirely, or almost entirely; lateral lobes usually have (in all apterous forms of the adult stage) two notches on their posterior margin: the dorsal notch, which harbors the base of the tegmina, and the ventral notch, situated beneath the dorsal one and somewhat in front of it (Figures 42, 44-48, and others). Tegmina (Figure 40) strongly abbreviated in the shape of small oval platelets on the sides of the body; wings (Figure 40) considerably longer than tegmina and folded beneath the pronotal process. seldom tegmina and wings are absent. Prosternum has an elevated flange-shaped anterior margin, covering the mouth from below. The anterior and middle tarsi are 2-segmented, the hind tarsi are 3 segmented, but the second segment is short,



Figures 40–43
(Original)

40—Tetrix nutans Hag., ♀, tegmen and wing, 41—Criotettix japonicus (Haan), ♀, head and anterior part of pronotum, dorsally (Japan), 42—Hedotettix alienus Uv., ♂, head and anterior part of pronotum, from the side (Seistan), 43—H. alienus Uv., ♂, middle femur and tibia.

and the first segment has 3 sharp pulvilli below. There is no empodium between the claws, and the hind femora have a small papilla on the inner carina (Brunner's organ) near their bases. Areas between the carinae on the outer side of the femora irregularly situated. Abdomen without tympanic organ; in the ♀ both pairs of valves of the ovipositor have numerous denticles on their margins (Figures 51-52).

An almost exclusively tropical family, reaching great diversity in the moist climate of the tropical zone, and often represented there by very peculiar forms. Only 27 species, belonging to 12 genera and 4 subfamilies, are known to be among the fauna of the U. S. S. R. and neighboring countries. The systematics of the family is insufficiently worked out, many species and genera being distinguished with difficulty. Divisions and features of subfamilies and certain genera require revision, which is possible only with considerable material from the tropical zone. Many species, especially in the subfamilies Metrodorinae and Tetriginae, are distinguished by a variability in degree of wing development, and are represented by two forms: the brachypterous, which has a posteriorly abbreviated pronotal process not extending beyond the posterior genua and short wings (shorter than the pronotal process); and the macropterous form, which has a strongly elongated, posteriorly awl-shaped pronotum and long wings, extending, together with the pronotal process, beyond the posterior genua. This fact makes the determination of species even more complicated.

85 The majority of Russian species, if not all of them, overwinter in larval or adult stages. Some species develop in 2-3 generations during summer. Almost all the species live close to moist meadows or banks of water bodies, some species being capable of swimming and diving.

In the majority of cases the usual length of the body (from head to tip of abdomen) is not given in description of species, the whole length, i. e., the length from head to end of pronotal process or to the distal part of the wings being given instead. The greatest dimensions of the macropterous form appear in brackets.

Key to Subfamilies and Genera of the Family Tetrigidae

1 (2). Frontal ridge strongly widened between the antennae, forming there a large frontal plate (1. Subfamily Cladonotinae). —Pronotum does not project anterad between the ocelli, it has short processes on the median carina, or is hump-shaped between its shoulders. Hind process flattened and does not extend beyond the posterior genua, in the ♀ it is notched at the apex. Anterior and middle femurs bear spine-like denticles. . . . . 1. Cladonotella Hanc.

2 (1). Frontal ridge bipartite, but narrow and with a furrow [groove]; its branches being slightly divergent, or parallel (Figure 5).

3 (8). Posterior angles of lateral lobes of the pronotum projecting distinctly outwards in the form of sharp spines (Figure 41) or obliquely truncated platelets when the body is examined from above. Vertex often without carina on its anterior margin. Anterior and middle femora often similar.

4 (7). Posterior angles of lateral lobes of pronotum directed laterally in the form of acute-angled platelets, or bearing a long thin spine (Figure 41). Third segment of hind tarsus shorter than the first (2. Subfamily Scelimeninae).

5 (6). Antennae long, thin, and articulated considerably below the level of the ventral margin of the eyes; lateral ocelli situated between the ventral margins of the eyes, or slightly lower. Spines of lateral lobes of pronotum at least slightly bent anterad. Both anterior pairs of femurs with 2-3 denticles for their dorsal and ventral carinas. Lateral margins of hind tibiae lamellate, with weak denticles; first segment of hind tarsus flattened and widened dorsally . . . . 2. Platygavialidium Günt.

6 (5). Antennae short, fully articulated between the ventral margins of the eyes, lateral ocelli situated in front of the middle of eyes. Spines of lateral lobes of pronotum lamellately-triangular and directed slightly obliquely caudad (Figure 41). Both anterior pairs of femora without denticles. Lateral margins of hind tibiae with distinct denticles; first segment of hind tarsus normal . . . . . 3. Criotettix Bol.

7 (4). Posterior angles of lateral lobes of pronotum projecting in the form of a short, obliquely-truncated platelet; posterior angles seldom rounded at the apex, but then the third segment of the tarsi is not shorter than the first, or other features given in the description of the subfamily on page 90 (3. Subfamily Metrodorinae) are marked. — Body thickset. Head does not project above the plane of the pronotum, and has a wide vertex which is not excavate between the eyes, anterior margin of vertex usually not limited by a carina. Pronotum roof-like for its whole length, or in its anterior part, lateral carinas approaching caudad in the prozona, and usually weak in front of the shoulders Third segment of hind tarsus considerably shorter than first. 4. Hyboella Hanc.

86 8 (3). Posterior angles of lateral lobes of pronotum excavate ventrad, and with rounded apex (Figures 42, 44-48, and others). Vertex with carina on its anterior margin. Middle femora more flattened than anterior ones, and often wider than them. Third segment of hind tarsi shorter than first (4. Subfamily Tetriginae).

9 (10). Frontal ridge in profile forms with the vertex an entire convex arc, extending ventrad up to the median ocellus (Figure 42). Antennae fully articulated between the eyes. Middle femora in ♂ considerably shorter and wider than in ♀ (Figure 43). Median carina of pronotum entire, sharp, fully reaching its anterior margin . . . . 5. Hedotettix Bol.

10 (9). Frontal ridge forming a convex arc in profile only between base of antennae, the vertex often projects anteriad between the eyes and then forms a distinct angle with the front (Figures 44-48, 59-62) Antennae articulated at least partly below the eyes (Figures 44-48, 59-62), or the middle femora in ♂ are normal, i.e., not wider and not shorter than in ♀.

11 (20). Eyes moderately convex, not projecting, or slightly projecting, above the level of the pronotum (Figures 44-48, 59-60). Prozona of the pronotum square, or moderately transverse, at the most being twice wider than its length (Figures 49-50, 63-66).

12 (19). Vertex when examined from above, wider than the eyes, in profile projecting anterad between the eyes (Figures 44-48). Median carina of pronotum reaches its anterior margin (Figures 49-50). Middle tibiae not tapered apicad.

13(16). Tegmina normal, entirely visible from the outside; wings fully developed, or moderately abbreviated. Posterior margin of lateral lobes of pronotum with two distinct notches, the dorsal one harboring base of tegmen (Figures 44-48, 58).

14(15). Frons weakly sloping, above the antennas being entirely, or almost vertical (Figures 44-48). Groove of frontal ridge almost reaches the fastigium dorsally (Figure 5). Pronotum roof-like dorsally, or almost flat; *posterior angle of lateral lobes narrowly-rounded.* Vertex moderately projecting anterad between the eyes (Figures 44-50). Small or medium-sized, the whole length of ♀ not exceeding 17 mm . . . . 6. Tetrix Latr.

15(14). Frons strongly sloping for its whole length, forming with vertex a very acute angle (Figure 59). Frontal ridge bipartite dorsally only halfway between the fastigium and the bases of the antennae, extending farther apicad in the form of an unpaired carina. Pronotum flat dorsally; posterior angle of lateral lobes widely rounded (Figure 59). Vertex very strongly projecting anterad between the eyes *(Figure 59). Large, the whole length of ♀ not less than 18 mm . . .* . . . . 7. Clinotettix B.-Bienko.

16(13). Tegmina and wings invisible from the outside and practically absent. Posterior margin of lateral lobes of pronotum without the dorsal (wing) notch (Figure 60).

17(18). Anterior and middle femora with straight, or slightly sinous ventral margins. Outside aspect of hind femora without tubercles. Frontal ridge narrow between antennae, not wider than first antennal segment. First segment of hind tarsus hardly 1.5 times longer than third . . . . 8. Formosatettix Tinkh.

18(17). *Anterior and particularly middle femora with strong lamellate lobes* on their ventral margins. Outer aspect of hind femora with distinct-
87 ly-projecting tubercles. Frontal ridge perceptibly widened between antennae, and considerably wider than the first antennal segment. The first segment of hind tarsus almost twice as long as the third . . . . 9. Mesotettix B.-Bienko gen. n.

19(12). Vertex not wide, usually narrower than the eye when examined from above (Figures 63-66), in profile it does not project anterad between the eyes. If of the same width as the eye, or slightly wider, then the middle tibiae are slightly tapered apicad. Median carina of pronotum often obliterated at its anterior margin (Figures 65-66). Pronotum not roof-like dorsally. . . . . 10. Paratettix Bol.

20(11). Eyes strongly convex and projecting distinctly above the level of pronotum (Figures 61-62). Prozona of pronotum very short, strongly transverse, more than twice, often 3 times wider than its length. Vertex narrower than the eye.

21(22). Antennae articulated at least partly between the eyes, lateral ocelli being situated at the middle of the eye (Figure 61). Middle femora at least slightly narrower than the visible part of the tegmen, and not bearing a regular row of setae on their ventral margins; middle tibiae not tapered apicad. Frontal ridge in profile forms an arc between *fastigium* and ventral ocellus (Figure 61) . . . . 11. Euparatettix Hanc.

22(21). Antennae articulated below level of ventral margins of eyes, lateral ocelli being situated below the middle of the eye (Figure 62). Middle

femora not narrower than the visible part of the tegmen, and with a regular row of setae on the ventral margins, middle tibiae slightly tapered from the base toward the apex. Frontal ridge in profile forms a convex arc only between bases of antennae (Figure 62) . . . . .12. Ergatettix Kirby.

1. Subfamily CLADONOTINAE

Frontal ridge bipartite and strongly widened between the eyes, forming there a large frontal plate, the width of which exceeds the width of the first antennal segment, eyes usually widely spaced; frons slightly sloping or vertical, antennae fully filiform. Pronotum sometimes strongly developed dorsad, often lamellate, frequently extending forward onto the head or having sinuous outlines No tegmina and wings in the majority of genera. Hind tibiae scarcely widened apicad, with strong denticles on margins.

A purely tropical subfamily, distributed in the Old and New Worlds, many species are notable for unusual and fancy external appearance. Certain genera have features resembling representatives of the subfamily Tetriginae.

One genus, reaching Japan, is examined below.

1. Genus Cladonotella Hanc.

Hancock, 1908, Trans. Ent. Soc. Lond.:395, Gunther, 1938, Mitt. Zool. Mus. Berl., 23:340.
Type of genus C gibbosa (Haan)

Antennae with strongly elongated segments. Pronotum truncated in front, not projecting forward between the eyes, being in its anterior part irregularly curved or with rather short pointed processes on the median carina. Hind process short, not extending beyond posterior genua, dorsally sloping caudad and somewhat flattened, notched and bidentate at the apex at least in the ♀. No tegmina and wings. Anterior and middle femora with spur-like denticles, median genicular carina of the hind femurs strongly projecting and pointed at the apex, the third segment of the hind tarsus almost of the same length as the first

Three species, distributed from Japan as far as New Guinea, are known. These species were previously considered as belonging to the genus Cladonotus Serv., which, as later shown, occurs only in Ceylon. Only one species, known from Japan, is given below.

1 (1). Pronotum between the shoulders with rather high, constricted process, which is not subdivided into smaller processes, the hind process in the ♂ pointed at the apex. Antennae articulated considerably lower than the eyes. Vertex in front with 3 small denticles, frontal ridge strongly projecting forward between the antennae The dorsal margin of anterior and middle femora in the ♂ sinous, in the ♀ with 3-4 denticles, ventral margin in the ♂ with one, in the ♀ with 2-3 denticles; dorsal margin of hind femora sinous, with one denticle in the

♂ and several denticles in the ♀. Length of pronotum in the ♂ 7.4-8.0, in the ♀ 9-10 mm; hind femora in the ♂ 5, in the ♀ 6 mm. — Japan, Ryukyu Islands, Java . . . . 1. C. gibbosa (Haan).

Haan, 1842, Verh. Natuur. Geschied. Nederl. Overz. Bezitt. :169, tab. XXII, Figure 14 (Acridium); Bolivar, 1887:209 (Cladonotus); Jakobson, 1905:207 (Cladonotus), Willemse, 1928, Zool. Mededeeling, XI:22, 26, Gunther, 1938, Mitt. Zool. Mus. Berlin, 23:341, Figures 32-33.

2. Subfamily SCELIMENINAE

Frontal ridge bipartite between the antennae, but narrow, and with a groove. Pronotum *not roof-like from above, truncated in front*, often produced in its posterior part into a very long process, reaching the distal part of the hind tibiae. Posterior angles of the lateral lobes of the pronotum directed sidewards in the form of sharp spurs or pointed platelets (Figure 41). Wings usually not extending beyond the distal part of the posterior process of the pronotum. Hind tibiae usually strongly widened apicad; their margin often lamellate and in this case entirely or almost entirely devoid of spurs. The first segment of hind tarsus longer, sometimes considerably longer, than the third segment and often thickened or flattened dorsally.

About 25 genera, distributed almost entirely in the Indo-Malayan area, are known; certain species penetrate into tropical Africa, Australia, and Southern China. Only 2 species, belonging to different genera, are known from Japan and Central China, and these two genera and species are examined below. Although Wu (1935) indicates the finding of Gavialidium crocodilus Sauss. in Northern China, this species is known to occur in Ceylon and its occurrence in China requires confirmation. Because of the above fact this genus and species are not examined in the present book.

Many species of this subfamily live near water and can swim and dive well.

2. Genus Platygavialidium Günt.

Gunther, 1938, Mitt. Zool. Mus. Berlin, 23:360, 373.
Type of genus: P. formosanum Tinkh., Taiwan.

Antennae long, thin, and articulated considerably below the level of the
89 ventral margin of the eyes; the middle antennal segments are many times longer than their width. Vertex excavate between the eyes and wider than the eye; lateral ocelli situated between the ventral margins of the eyes or even lower. Pronotum produced in its posterior part into a long process; pronotum not convex from above, smooth or even concave in the area of the shoulders; the median carina is low between the transverse grooves. Immediately posterior to the angles of the shoulders, the median carina has low hump-like swellings or is sinous. The angles of the humeri are distinctly marked, not rounded, and sometimes have a small tubercle or are almost acute; the external and internal carinas are fused at the shoulders and posterior to them, so that an isolated carina parallel to the margin of the

pronotum is entirely absent there, the spines on the lateral lobes of the pronotum being slightly bent forward. Anterior and middle femora with 2-3 narrow, not lobellate, denticles along the dorsal and ventral carinae, the hind femora often with tubercle-like denticles along the ventral carina and with low denticles along the dorsal carina; the hind tibiae widened apicad and with lamellate margins, at apex, devoid of large spines, the first segment of the hind tarsus is widened and flattened from above, the third segment being normal, not thickened.

Up to 5 species are distributed from continental China to Taiwan and the Philippines, certain species were considered by former authors as representatives of the genus Eugavialidium Hanc. or the genus Gavialidium Sauss. Only one species is examined below.

1(1). Vertex in the ♀ almost twice as wide as the eye, and not narrowed in front, the dorsal margin of the lateral ocelli situated on the same plane as the ventral margins of the eyes. Pronotum with distinctly marked, projecting, almost right-angled humeri, but without a tubercle on them, pronotum coarsly net-like with distinct little pits on its dorsal aspect, the hind process with thick, large, and regularly situated nodules Hind tibiae moderately widened apicad, with 5-6 small denticles along the margins. The length of pronotum 19.8, of hind femurs 8.2 mm, width at the shoulders 5.8 mm in the ♀, the ♂ not *described. Described as from "Northern China", but in reality was* found near Shanghai, and there are also indications as to its occurrence in Southern China . . . . 1. P nodiferum (Walk.)

Walker, 1871, Cat. Derm. Salt. Brit. Mus., V.822 (Tettix), Jakobson, 1905 208 (Tettix). —uvarovi Günther, 1938, Mitt. Zool. Mus. Berlin, 23 376, Figures 65-69.

3. Genus Criotettix Bol.

Bolivar, 1887:222, Jakobson, 1905.208 Günther, 1938, Stett. Ent. Zeitg., 99.131. —Acanthalobus Hancock, 1904, Spol. Zeylan., II 131.

Type of genus C bispinosus (Dalm), Indo-Malayan region.

Antennae fully articulated between the ventral margins of the eyes, short, their length not exceeding the greatest width of the pronotum at the shoulders Eyes not projecting above the level of the vertex and pronotum, lateral ocelli situated at the mid-point of the eyes, vertex flat, *in front* edged with a carina, wider than the eye, when examined from above (Figure 41), only in the ♂ being of the same width as the eye, Distal segment of maxillar palpus not widened Pronotum flattened from above, with rounded obtuse-angular shoulders, its posterior process reaching the apex of the hind tibiae. Spines on the lateral lobes directed toward the sides and slightly caudad, usually long, pointed, and lamellate at the base (Figure 41), seldom weakly expressed. Hind tibiae moderately widened apicad, with well-developed spurs on the sides, first segment of hind tarsi normal

90 Up to 10 *species,* distributed *from Japan and Southern China to India,* Ceylon, Java, and the Celebes, are known, only one species from Japan is given below.

1(1). Median antennal segments very short, in the ♀ twice as long as their width Vertex in the ♀ almost twice (Figure 41) and in the ♂ almost

1.5 times wider than the eye. Frontal ridge in profile strongly roundly projects between the antennas, farther upward strongly lowered in the ♂ entirely vertical and in the ♀ almost vertical there. Lateral processes of the pronotum strongly lamellately widened at the base, suddenly narrowed later into a narrow spine (Figure 41), or with an isolated spine which is almost unnoticeable, the processes having the form of acute-angular platelets. The dorsal part of the pronotum slightly concave between the carinas behind the shoulders. The total length of the ♂ 17.5-18.0, of the ♀ 12.5-21.0 mm; hind femurs in the ♂ 6.5-7.0, in the ♀ 7.5 mm; width at the humeri in the ♂ 3.0, in the ♀ 3.7 mm. —Japan, Tsushima Island, Ryukyu Islands .... 1. C. japonicus (Haan).

Haan, 1842, Verh. Natuur. Geschied. Nederl. Overz. Bezitt.:169 (Acridium), Günther, 1938, Stett. Ent. Zeitg., 99:147, Figure 35.—bispinosus Jakobson, 1905:208 (partly).

3. Subfamily METRODORINAE

Frontal ridge bipartite between the antennae, narrow or moderately widened, with a groove; antennas articulated between the ventral margins of the eyes or below them, filiform, often very thin. Pronotum usually truncated in front, very seldom projecting slightly obtuse-angularly; posterior angles of the lateral lobes widened lamellately, directed slightly outward and obliquely truncated, very seldom projecting in the form of short obtuse-angular platelets. Sometimes the posterior angles are excavate ventrad and rounded, but then at least one of the following features is present: the third segment of the hind tarsus is not shorter than the first, or the anterior and middle femurs are well-shaped and entirely similar; or the vertex is unusually narrow or with obliquely situated lateral vertexal carinas approaching each other anteriad or if it is wide, it is not edged with a carina in front; or the pronotum is almost flat dorsally, with distinctly-marked straight longitudinal carinae between the shoulders and with a median carina. Hind tibiae weakly widened apicad, with distinct spurs along the margins.

A purely tropical subfamily, including up to 80 genera and a considerable number of species.

The systematics of the subfamily has been inadequately worked out and it is impossible to determine many genera and species without comparative material. The limits of the subfamily are indistinct, and certain genera, according to their features, are transitory to the 2 neighboring subfamilies: Scelimeninae, and Tetriginae.

Certain genera penetrate into Southern China, one of them reaching Tibet; only this genus is examined below.

4. Genus Hyboella Hanc.

Hancock, 1915, Records Ind. Mus., XI.59, 104, Gunther, 1939, Abhandl. Berich. Staat. Mus. Dresden, 20, Zool., 1.205.

Type of genus: H. tentata Hanc., Assam.

91 Rather thickset. Head does not project above level of pronotum; antennae articulated between the ventral margins of the eyes or slightly below; lateral ocelli situated in front of the mid-points of the eyes or slightly below; vertex seldom considerably wider than the eye, often moderately narrowed anteriad, slightly convex between the eyes, seldom slightly projecting above the dorsal margins of the eyes, when examined in front and from the side, the median and lateral carinae developed, but with anterior margin indistinctly edged, usually without a transverse carina; frontal ridge in profile projecting between the bases of the antennae in the form of an arc which is situated between the dorsal and ventral ocelli, above the dorsal ocelli frontal ridge usually low. Pronotum rather wide at the shoulders, thick, elevated in its anterior part and roof-like, with a sharp, but not lamellate median carina, and with weakly depressed, almost flat, lateral slopes, in its posterior part also roof-like or flat. In the latter case it has a weakly-developed median carina. The anterior margin of the pronotum is truncated or projects slightly obtuse-angularly, the posterior process usually does not extend beyond the posterior genua, sometimes roundly truncated at its distal part; lateral carinae perceptibly approaching caudad in the prozona, distinct at the sides of the posterior process, but in front of the shoulders often weak or obsolescent. Posterior process of the lateral lobes of the pronotum obliquely incised at the end, slightly projecting outward, more seldom almost spine-like or bent ventrad and rounded, as in representatives of the subfamily Tetriginae. Tegmina and wings are absent or tegmina are narrow, the wings partly reduced, more seldom both the wings and the tegmina being normally developed. Anterior and middle femora not wide, with slightly sinuous margins, hind femora short and wide, with entire ventral margin, the third segment of the hind tarsus considerably shorter than the first.

This genus is insufficiently studied, and difficult to characterize, including up to 15 species distributed from the Himalayas to southern India, Java, Sumatra, and the Kai Islands. One authentic species is known from Tibet, but there, as well as in the mountains of the Southern China and in Kashmir, the possibility of finding yet unknown, or already described, species exists. According to their features, certain species can be differentiated with difficulty from the species of the genus Coptotettix Bol. (subfamily Tetriginae) and the genus Criotettix Bol. (subfamily Scelimeninae). Only one species from Tibet is described below.

1 (1). Tegmina and wings entirely absent Pronotum with granules resembling sand particles, truncated in front, the posterior process reaches the apical fourth of the hind femora, the dorsal part of the pronotum distinctly roof-like; the median carina sharp, in profile convex and slightly sinuous. Vertex from above considerably wider than the eye and has depressions on the sides, frontal ridge strongly convex between the antennae. Antennae articulated slightly below the ventral margin of the eyes, with 7-15 elongated segments. Total length of the ♀ 10, of the pronotum 7, of the hind femurs 5.5 mm, the ♂ unknown. —Tibet· Mount Everest, altitude 3,600 m. . . . . 1. H. tibetana Uv.

Uvarov, 1925, Ann. Mag. Nat. Hist., (9), XVI 165.

4. Subfamily TETRIGINAE

Frontal ridge between antennae narrow, with a furrow; the vertex either wide or not very wide, always wider than the first segment of the antennae, anteriorly confined by the carina; the lateral carinae (at the interior eye
92 margin) are parallel. The antennae 12-15 segmented, filiform. The pronotum is trimmed anteriorly or is projected in the form of an angle; the top of it is often roof-shaped but if almost flat it is usually without regular parallel carinas between the shoulders. The posterior angle of the lateral lobes of the pronotum is directed downwards, completely rounded but not trimmed and without a sharp process, only sometimes posteriorly obtuse angular. The anterior femora are more cylindrical and often markedly narrower than the middle femora. The posterior tibiae are only slightly widened at the apex; the third segment of the hind tarsi is shorter than the first.

A great number of genera and species which are very similar to each other and difficult to distinguish; in contrast to the previous one, this subfamily is well represented in the moderate zone of Eurasia; 23 species belonging to 8 genera are considered below.

5. Genus Hedotettix Bol.

Bolivar, 1887:283, Kirby, 1914:71.
Type of genus: H. gracilis (Haan), Indo-Malayan region.

Antennae thin, reaching posterior margin of lateral lobes of pronotum, attached completely between the ventral margins of the eyes (Figure 42). Eyes moderately convex, not projecting over the level of the pronotum. Frontal ridge in profile forms together with the vertex a convex arch extending down between the ocelli without incision (Figure 42), to the median ocellus; very seldom the frontal ridge projects in the form of a convex arch only between the apex of the vertex and the median ocellus as the vertex forms with the front a slight obtuse angle; the lateral ocelli are situated nearer to the fastigium than to the ventral margin of the eye. The vertex is narrower or not wider than the eye, with a sharp median carina; the anterior margin seen from above does not project beyond the anterior margin of eye. The pronotum is trimmed anteriorly or slightly projects angularly from above with a sharp carina, posteriorly strongly elongated or reaching only the posterior genua; the prozona moderately transverse, usually not more than 1.5 times wider than its length; the posterior angle of the lateral lobes is narrowly rounded. Tegmina are normal; the wings are completely developed or shortened. The middle femora in ♂ are short;

twice the width of the front ones (Figure 43) and often tapering at the top, in ♀ narrow with parallel sides, the third segment of the hind tarsi markedly shorter than the first

A small number of species mainly in Indo-Malayan region, separate species are known also in tropical Africa and one species reaches northern Iran and Afghanistan. The occurrence of 1-2 Indo-Malayan species is possible also in adjoining China.

1 (1). The vertex is markedly narrower than the eye, in profile it forms with the frons a wide rounded arc (Figure 42), the frontal ridge is gradually widened down to the median ocellus but below the base of the antennae it is not parallel. The anterior margin of the pronotum is straight or slightly arc-shaped, but not projecting as an obtuse angle, median carina in the thoracic part slightly arc-shaped. Middle femurs in ♂ with slightly sinuous dorsal and ventral carinas (Figure 43). Dorsal margin of the hind femora, before reaching the genua, —with a projecting small lobe, sometimes almost disappearing. The total length ♂ 11.8-13.0, ♀ 13.5-16.5 mm, the hind femora ♂ 4.5-5.3, ♀ 5.0-6.5 mm. —Iran from southwestern part (Khuzistan!) to eastern
93 province (Khurasan and Seistan!) and southeastern (Kerman), southern Afghanistan, Iraq, Arabia to Oman (') in the north Flies in the direction of light at night. . . . . 1. H. alienus Uv.

Uvarov, 1936, Linnean Soc. Journ., Zool., XXXIX 553, Figure 5

6. Genus Tetrix Latr.

Latreille, 1802, Hist. Nat. Crust. Insect, III.284, Jakobson, 1905:208 Hancock, 1906, Gen. Insect., 48, Orth. Tetrig 57, Roberts, 1941:219. —Acrydium Rehn, 1904, Proc. Acad. Nat. Sc. Philadelph., LVI 666 (nec Geoffroi) Uvarov, 1927a:201. —Tettix Charpentier, 1841, Germar's Zeitschr. Ent., III:315 Bolivar, 1887 257.

Type of genus T subulata (L.)

The antennae 13-15 segmented, rather short (Figures 53-55), do not project over the posterior margin of the lateral lobes of the pronotum, are inserted lower than the eyes or partly between the eyes (Figures 44-48). Eyes moderately convex, together with the vertex do not project over the level of the pronotum (Figures 44-48), the vertex wide, seen from above wider than the eye (Figures 49, 50), the anterior margin of the vertex dorsally as well as laterally projects forward between the eyes, frons moderately slanting or almost upright, the frontal ridge projects forward only between the antennae, between the eyes straight (Figures 44, 46) or with an incision (Figures 45, 47-48) and usually here completely perpendicular, more seldom a little slanting, the groove of the frontal ridge on the top almost reaching the fastigium (Figure 5). The pronotum from above at least slightly or partly roof-shaped, the median carina always reaches its anterior margin (Figures 49-50), the prozona moderately transverse, sometimes almost square, the anterior margin projects in the form of an angle or is truncate, the posterior process is short, hardly reaching the hind genua, or it is long, awl-shaped Tegmina developed, normal, wings

shorter than the pronotum or if completely developed, do not extend beyond or extend a little beyond the apex of the processus of the pronotum. The middle femora of equal width in both sexes; the middle tibiae are not narrowed at the apex; the inner small apical tooth on the dorsal aspect of the first segment of the hind tarsus often strongly sharpened and obliquely elevated. A great number of species distributed over almost the whole globe, including also the temperate zones; some species are very similar to each other and are difficult to distinguish.

The denomination of the genus has often been changed. At the present time the above-mentioned genus name has been ascertained. Below are keys for 13 species known from the U. S. S. R. and adjoining countries.

1 (24). The carina of the pronotum regular without depression nearly to the middle; the surface of the pronotum on the sides of the carina is plain. The body slightly or moderately coarse.

2 (9). The middle femora narrower than the visible part of the tegmina. The pronotum is normally elongated posteriorly into a long process extending far over the hind genua; its anterior edge is trimmed, the median carina is low, in profile straight for a considerable distance (Figures 44-46). The valves of the ♀ ovipositor are narrow; dorsal margin of the dorsal pair is lowered gradually toward the posterior end (Figure 51). The antennae are short and thick; their median segments are 2.5-3 times longer than their width.

94 3 (6). The vertex viewed from above considerably wider than the eye, distinctly projects forward between the anterior margins of the eyes. Frontal ridge in profile over the bases of the antennae upright (although sometimes with an indentation), forms a right angle with the vertex (Figures 44, 45). The hind femora are narrow, more than 3 times longer than their maximal width.

4 (5). The middle femora considerably narrower than tegmina with a straight ventral margin. Frontal ridge in profile between the eyes is straight or a little bent in (Figure 44); its furrow almost reaches the fastigium and is separated from the latter by a very short carina; its length is less than the width of the first antennal segment (Figure 5). The anterior margin of the vertex viewed from above projects obtuse-angularly, more seldom rounded, in the middle without sharp projection. The total length ♂ 11.0-13.8; ♀ 12.5-17.0 mm; the hind femurs ♂ 4.8-6.3, ♀ 6.3-7.3 mm. —The whole European part of U. S. S. R. with exception of the polar zone, Siberia to Yakutia, Amur Region and Ussuri Territory, Kazakhstan to the valley of the Ili River, mountains of the northern part of Middle Asia to Przhevalsk, Transcaucasus; northern Mongolia, Kashmir (?), West Europe, North America. The details of distribution in southern U. S. S. R. are not clear because it has been confused with T. bolivari Saulcy. The larvae and adults hibernate in moist meadows and on forest borders. Registered in Germany as dangerous to shoots and seedlings of pine, oak, and beech. Gnaws stems and also beech leaves. . . . . *1. T. subulata (L.)—Narrow tetrix [Uzkii tetriks].

Linnaeus, 1761, Faun. Suec[iae]:236 (Gryllus). Jakobson, 1905:210, plate VII. Uvarov, 1927a:202, Figure 266 (Acrydium). Tarbinskii, 1940:34, 218, Figure 166 (Acrydium).—granulatum Kirby, 1837, Fauna Bor.-Amer., Ins.:251 (Acrydium).

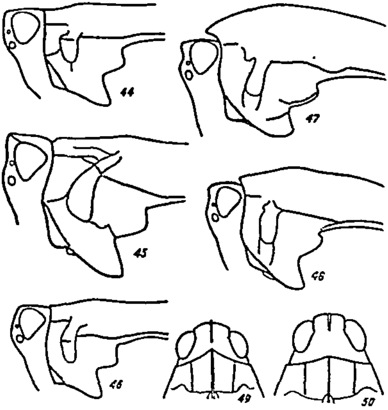


Figure 44-50
(Original)

44—Tetrix subulata (L.), ♀, head and anterior part of pronotum from the side (Leningrad), 45—T. fuliginosa (Zett), ♀, ibid. (Kola Peninsula), 46—T. bolivari (Saulcy), ♀, ibid. (Moldavia), 47—T. tartara (Bol.), ♀, ibid. (Farab), 48—T. tartara subacuta subsp. n., ♀, ibid. (Tentek River), 49—T. simulans (B.-Bienko), ♀, *head and prozona of pronotum, dorsally (Minusinsk)*, 50—T. nutans Hag., ♀, ibid. (Switzerland)

5(4). The middle femora only a little narrower than the visible part of tegmina, with slightly sinuous ventral carinas. Frontal ridge in profile between the eyes with a strong indentation (Figure 45); its groove far from reaching the fastigium; unpaired carina over the furrow is longer than the width of the first antennal segment. The anterior margin of the vertex is only slightly arc-shaped, almost straight, in the middle with a strong, narrow projection. The body often entirely black or with admixture of black color. The total length ♂ 14.0-15.5, ♀ 15.5-17.0 mm; the hind femora ♂ 5.9-6.5, ♀ 6.5-7.2 mm. The polar zone and the north forest zone of the European part of the U.S.S.R. from the Kola Peninsula to Archangel and Ust-Tsylma (!), northern Siberia (middle current of Yenisei and Igarka!) to Yakutsk, Kolyma (!) and Nikolaevsk-on-Amur (!), Sakhalin (!); Finland, northern Scandinavia, Scotland . . . . *2. T. fuliginosa (Zett.)—Dark tetrix [Temnyi tetriks].

Zetterstedt, 1828, Fauna Ins. Lappon., I 452 (Acrydium), Jakobson, 1905:210, Miram, 1933:44 (Acrydium).

6(3). The vertex narrow, seen from above only a little wider than the eye; the anterior margin of the vertex at the most projects forward a little between the eyes. Frontal ridge in profile over the base of the antennae at least slightly slanting backwards and forms an obtuse angle (Figure 46) with the vertex. The hind femora wider, not more than 3 times longer than their width.

7(8). The median carina of the pronotum low, not compressed from the sides and does not seem to be sharp-lamellar, in the metazona not
95 better-developed than the lateral carinas. The prozona with completely straight and parallel lateral carinas. The apex of the pronotum flatter, with single small granules and sometimes with carina-shaped elevated wrinkles between the shoulders. The visible part of the tegmina tapers more sharply toward the apex, ventral margin in the apical half is more slanting. The middle femora with slightly wavy margins. Larger. The total length ♂ 11.0-12.3, ♀ 12-14 mm; the hind femora ♂ 4.8-5.6, ♀ 5.8-6.2 mm. —South Moldavia (!), southern Crimea (!), eastern Ciscaucasus, Transcaucasus, Middle Asia, except the mountains; northern Iran, Asia Minor, Palestine, southern Europe as far as Spain; *was formerly confused with* T. subulata. The distribution has been insufficiently investigated (Figure 46). . . . . *3. T. bolivari Saulcy.

Saulcy, 1901, Miscell. Entom., IX:61; Uvarov, 1942:354, tab. XXIX, Figures 111-113. —caucasicus Bol.-Bosko, 1931, Bol. Soc. Espan. Hist. Nat., XXXI.226, Figures 5-7 (Paratettix). Tarbinskii, 1940.220, Figure 170 (Paratettix).

96 8(7). The median carina more elevated, compressed laterally and is very sharp and slightly lamellar, elevated in the metazona much more than the lateral carinae, the lateral carinae in the prozona slightly (sometimes indistinctly) are bent outwards or behind are slightly bent inwards. The apex of the pronotum is bent in between the median and lateral carinae, with irregular scattered tubercles of various size. The visible part of tegmina tapers weaker toward

the apex, ventral margin in the apical half is arcuately bent. The middle femora as in preceding. Smaller. The total length ♂ 9.5-10.0, ♀ 11.3-12.5 mm, the hind femurs ♂ 4.5, ♀ 5.8 mm. —West Germany, England, Holland, Belgium, France, Iberian Peninsula, Italy, Yugoslavia, North Africa, Was confused with T. subulata. Distribution insufficiently investigated. . . . . 4. T. ceperoi (Bol.)

Bolivar, 1887:267 (Tettix), Uvarov, 1940, Journ. Soc. Brit. Ent., 2 72, Figure 11, 1942:356

9 (2). *The middle femora noticeably wider than the visible part of tegmina.* The pronotum usually shortened, behind it does not extend beyond or extends a little beyond the hind genua. But if the pronotum is elongated behind into a long process, there are three possibilities either its anterior margin projects in the form of an angle (Figures 47-49), or the median carina is high, arcuate in profile (Figures 47, 48), or the dorsal valves of the ovipositor ♀ are wider, their dorsal margin sharply lowered toward the hind end (Figure 52).

10 (13). Ventral margin of the anterior and middle femora is wavy (as in Figure 57). Dorsal margin of the hind femora in the apical half is either slightly wavy or with a projecting small lobe not reaching the genicular part. Frontal ridge in profile with a distinct notch between the eyes (Figures 47, 48).

11 (12). The pronotum with a trimmed anterior margin and with a lower not arcuate in profile median carina, the hind process of the pronotum normally only slightly extends beyond the genua. Ventral angle of the lateral lobes of the pronotum broadly rounded. The antennae thick, their middle segments 2.5-3 times longer than their width The total length ♂ 9.5-10.0, ♀ 11.2-14.0 mm, the hind femora ♂ 5.0-5.3, ♀ 5.8-6.3 mm. —*Romania,* Yugoslavia, Austria, *South Germany,* Switzerland, southeastern France . . . . 5 T. türki (Krauss)

Krauss, 1876, Entom. Monatsbl., 1 103 (Tettix) Jakobson, 1905 210.

12 (11). The anterior margin of the pronotum projects in the form of an angle, the median carina high, lamellar, arcuate in profile (Figures 47-48), the posterior process of the pronotum either does not extend *beyond or strongly extends beyond the hind genua. Ventral angle of* the lateral lobes of the pronotum is not very broadly rounded. The antennae thin, their middle segments 3-3.5 times longer than their width. The long-winged forms occur more frequently than either normally short-winged species. . . . . . . *6. T. tartara (Bol.)

97 a (b). *The median carina of the mesonotum very high, lamellar, not lower* or even higher than the height of the lateral lobes, abruptly arcuate (Figure 47). The anterior angle of the pronotum sharp, long, almost extending forward between the eyes to the level of the anterior margin of eyes (Figure 47). The total length ♂ 8-10 (12), ♀ 9 5-11.0 (14.5) mm, the hind femora ♂ 5.0-5.4, ♀ 5.7-6.1 *mm —Middle Asia* from southern Turkmenia, Tadzhikistan and Pamir to Kzyl-Orda,

sands of Muyun-kum (!) and Frunze (!); in the north does not extend far into mountains. Banks of rivers and irrigation canals and irrigated grounds, especially those with lucerne. A case of slight damage to lavender in Tadzhikistan was noted *6a. T. tartara tartara (Bol.)

Bolivar, 1887:262 (Tettix), Jakobson, 1905:209, Uvarov, 1927a:203, Figure 268 (Acrydium). — serripes Redtenbacher, 1889, Wien. Ent. Zeit., VIII:28 (Tettix).

b (a). The carina of the pronotum moderately high, not higher or slightly higher than lateral lobes, in profile moderately arcuate (Figure 48). The anterior angle of the pronotum obtuse or straight, not extending forward between the eyes over their middle (Figure 48). The dimensions as in preceding. —Kirghizia: Issyk Kul depression; Kazakhstan: Zaisan depression, the whole southeast (Ala Kul depression, Balkhash Region, valley of Ili River to the Chinese border, Alma-Ata) and south of the central part (Sherubai-nura to south from Karaganda, the middle and lower current of Sary-su River). (The type from the lower parts of the Tentek River). . . . . *6b. T. tartara subacuta B.-Bienko subsp. n.

13 (10). The lower margin of the anterior and middle femora straight, only sometimes slightly wavy in the middle femurs. Dorsal margin of the hind femora solid [one-piece].

14 (21). The antennae considerably (not less than 1.5 times) longer than the anterior femora with thinner segments; the length of the middle segments 3-4 times more than their width (Figures 53-54).

15 (16). The anterior margin of the pronotum projects distinctly in the form of an obtuse angle (Figure 49); the median carina high, sharp, lamellar. The middle femora wider, a little more than 2.5 times longer than their width. Median segments of antennae not less than 4 times longer than wide. The body often unicolored black. The total length ♂ 8.2-9.5 (12.0), ♀ 9.5-11.0 (14.1) mm; the hind femurs ♂ 4.9-5.2, ♀ 5.7-5.9 mm. —South Siberia from Altai (!) and Yenisei to Transbaikal Region, Amur Region and Ussuri Territory (!); northern Mongolia: Kentei (!). .*7. T. simulans (B.-Bienko).

Bei-Bienko, 1929, Eos, V:367, Figure 1 (Acrydium). —amurense Bei-Bienko, 1929, Eos, V:368, Figures 3-4 (Acrydium).

16 (15). The anterior edge of the pronotum is trimmed or hardly noticeably projects in the form of a very slight obtuse angle (Figure 50); the median carina moderately high, poorly lamellar or low. The middle femora lower, not less than 3 times longer than wide.

17 (18). The wings in a normal (short-winged) form with a solid [one-piece] edge and broadly rounded apical angle (Figure 56). Dorsal valve of the ♀ ovipositor almost 4 times longer than their width; their dorsal margin gradually lowers in the forms of an arc toward the posterior end. The middle segments of the antennae not more than 4 times longer than their width (Figure 54). The body narrower in the shoulders, with a stronger elevated, partially lamellar median carina of the pronotum and narrower hind femurs, which are 3 times longer than their maximal width. The total length ♂ 9.0-9.5, ♀ 9.8-12.0 (15.8) mm, the hind femora ♂ 5.6-5.8, ♀ 6.5-7.0 mm. —Latvia,

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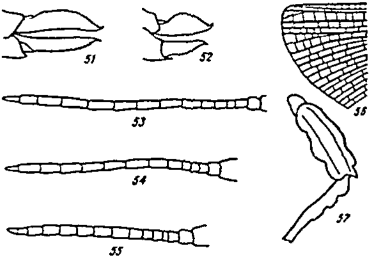


Figures 51-57
(Original)

51—Tetrix subulata (L.), ♀, ovipositor, 52—T. nutans Hag., ♀, ovipositor, 53—T. nutans Hag., ♀, antenna (Switzerland), 54—T. vittata (Zett.), ♀, ibid. (Gotland island), 55—T. bipunctata (L.), ♀, ibid. (Leningrad), 56—T. vittata (Zett.), ♀, apex of wing (Aland island), 57—Paratettix uvarovi Sem., ♂, middle femur and tibia (Termez).

Figure 58. Tetrix nutans Hag., ♀ (Simferopol'). (Original)

southern Sweden, including islands: Eland and Gotland, Åland Island (!); Central Europe from Poland and East Germany to Holland and Belgium, British Isles, France, Switzerland and Austria. Formerly was confused with T. nutans and T. bipunctata (L.); is probably also found in other places in the western U.S.S.R. Evidently is developed in 2-3 generations a year . . . . *8. T. vittata (Zett.)

Zetterstedt, 1821, Orth. Sueciae:121 (Acrydium). Carpentier, 1942, Bull. Mus. Hist. Nat. Belg., XVIII, No. 44:9, Figures 11-14, No. 57:8, Figures 18, 25, 28-29, 32, 34 (Acrydium). —kiefferi Saulcy, 1901, Miscell. Ent., IX:52, Chopard, 1922:119, 139, Figure 322 (Acrydium).

18 (17). The wings in the normal (short-winged) form with a wavy scalloped exterior margin and with a more narrowly rounded apical angle (Figure 40). The superior valves of the ovipositor wider, only 3 times longer than their width with an abruptly arcuate dorsal margin sharply lowering backwards (Figure 52). The middle antennal segments 3-4 times longer than their width. The body wider in the shoulders with a weakly lamellar or lower median carina; the hind femora wider, less than 3 times, sometimes only 2.5 times longer than they are wide.

99 19 (20). The median carina of the pronotum rather high, slightly lamellar, developed and elevated considerably more than the lateral carinas. The apex of the pronotum distinctly longitudinally bent in between *the median and lateral carinas, the anterior margin projecting* hardly noticeably in the form of an obtuse angle (Figure 50). *9. T. nutans Hag. —Thin-feelered tetrix.

a (b). The middle antennal segments 4 times longer than they are wide or in individuals from the most southern part of the areal even a little longer (Figure 53). The total length ♂ 8.5-10.0 (12.2), ♀ 9.0-12.5 (14.0) mm; the hind femurs ♂ 5.5-6.0, ♀ 6.2-7.0 mm. —Southern part of European part of U.S.S.R. from Moldavia to Ciscaucasus and Lower Volga Region, Transcaucasus, southwestern Kazakhstan; Central and southern Europe, Asia Minor; indicated for Kashmir and China (this must be confirmed). The northern and southeastern boundaries of areal are insufficiently known because this species was formerly confused with the next subspecies with which it is closely related. (Figures 40, 50, 52, 58). Probably this subspecies is responsible for the damage in Germany of 1-2-year-old pine seedlings . . . . *9a. T. nutans nutans Hag.

Hagenbach, 1822, Symb. Faun. Ins. Helvet: 41, Figure 25 (f. macroptera). —obscura Hagenbach, 1822, cited publications:42, Figure 26 (nec Zetterstedt, 1821). —bipunctata Jakobson, 1905:209 (partim) nec Linnaeus, 1758), Chopard, 1922:119, 138, Figures 319, 321 (Acrydium), Uvarov, 1927a:203, Figures 262, 265, 267, 270 (Acrydium). —tenuicorne Tarbinskii, 1940:218, Figure 168 (Acrydium) (not Sahlberg, 1891).

b (a). The middle antennal segments 3 *times longer than they are wide.* Dimensions of body as in preceding species. —The whole European part of the U.S.S.R. with exception of the polar zone and extreme south, Siberia to Yakutia and Baikal, Kazakhstan, Caucasus ridge; South Finland, Central Europe (the peculiarities of distribution are

not clearly known because it was confused with the preceding subspecies and with T. vittata (Zett.). Moist meadows, forest borders, sides of water bodies . . . . *9b. T. nutans tenuicornis (Sahlb.)

Sahlberg, 1891, Medd. Soc. Faun. Flor. Fenn., XIX:47 (Tettix).—bipunctata Jakobson, 1905:209 (partim).

20(19). The median carina of the pronotum low, not lamellar, in profile almost straight, not better developed or a little better-developed than the lateral carinas. Apex of pronotum slightly or moderately roof-shaped, not bent in at the sides of the median carina, the anterior edge completely trimmed. The total length ♂ 8.0-9.5 (12.5), ♀ 9.0-13.0 (16.5) mm; the hind femora ♂ 5.2-6.0, ♀ 5.8-7.7 mm. — Transbaikal, Amur Region, Ussuri Territory, Sakhalin, Japan, Manchuria, northeastern China and the central provinces south to Szechwan and Hupeh, Inner Mongolia. *10. T. japonica (Bol.)

Bolivar, 1887:263 (Tettix). Jakobson, 1905:210, Bei-Bienko, 1933, Ark. Zool., 25A, No. 20:9.—sibiricus Bolivar, 1887:265 (Tettix) Jakobson, 1905:210.—longulus Shiraki, 1906, Trans. Sapporo Nat. Hist. Soc., 1(2):161 (Tettix).—ussurianum Bei-Bienko, 1929, Los, V:370 (Acrydium).

100 21(14). The antennae are a very little longer than the anterior femora, thick; the middle segments 1.5-2 times longer than they are wide (Figure 55). The anterior margin of the pronotum projects distinctly in the form of an obtuse angle.

22(23). The frontal ridge in profile between the eyes straight, without a notch. The median carina in the anterior part of vertex is only a little more elevated than in the posterior part and it only slightly projects into the middle of the anterior margin of the vertex. The ventral notch of the posterior margin of the lateral lobes of the pronotum completely right-angled. The apex of the pronotum near to the middle often with 2 oblique black triangular spots. The total length ♂ 8.5-10.0 (12.2), ♀ 10.0-12.0 (14.5) mm, the hind femora ♂ 5.5-6.2, ♀ 6.3-6.8 mm. —Central and northern zone of European part of the U. S. S. R. to polar zone (Kola and Kanin peninsulas) and southwards to forest-steppe (Kiev, Voronezh, Kuibyshev, South Ural), Siberia to Maritime Territory and in north to Verkhoyansk and Yakutsk, forest-steppe of Kazakhstan, Altai, mountains of North Caucasus (Teberda), Central and northern Europe, and mountains in southern Europe, Mongolia, northeastern China south to Shansi and Shantung. Larvae and adults hibernate on borders of pine forests and in broad-leafed forests in the south, also in moist meadows. . . . . *11. T. bipunctata (L.)—Short-feelered tetrix [Korotkousyi tetriks].

Linnaeus, 1758, Syst. Naturae (ed. X) 427 (Gryllus Bulla) Ander, 1931, Ent. Tidskr., 52:245 (Acrydium) Miram, 1933:44 (Acrydium).—kraussi Saulcy, 1888, Bull. Soc. Ent. France, (6) VIII: CXXXV. Jakobson, 1905:209 Uvarov, 1927a:203, Figure 271 (Acrydium).

Biology —kraussi Strakhovskii, 1927, Russkoe entomologicheskoe obozrenie, XXI:245-247, Figures 1-2 (Acrydium).

23 (22). The frontal ridge in profile between the eyes with a distinct notch. The median vertex carina in the anterior part of the vertex is considerably more elevated than that in the posterior part and projects strongly forward in the middle of the anterior margin. Ventral notch of the posterior margin of lateral lobes of the pronotum slightly obtuse-angled. The apex of the pronotum with two irregular black strips on the sides but without triangular oblique spots near to the middle. The length ♀ 8.0-8.5, of the hind femora 5.7-5.8 mm; ♂ unknown. —China: Kansu. 12. T. sjöstedtiana B.-Bienko nom. n.

—sjöstedti Bei-Bienko, 1933, Ark. Zool. 25A, No. 20 11, Figure 1 (not Hall, 1909).

24 (1). The carina of the pronotum in the anterior half rather high, roof-shaped, near the middle farther backward sharply lowered; on the sides of the carina near to the lower part two notches. Body very coarse. Ventral margin of the anterior and middle femurs wavy. The hind femora with rough dorsal and ventral carinas and with irregular tubercles outside. The total length ♂ 7.8-8.5 (11.5), ♀ 9.3-10.2 (13.5) mm; the hind femurs ♂ 4.5-5.0, ♀ 5-6 mm. —South Crimea, Black Sea coast of Caucasus, Transcaucasus, Turkmenia (Kopet Dag); mountains of Afghanistan, northern and western Iran (Isfahan), Asia Minor, southern Europe, North Africa . . . . *13. T. depressa Bris.

Brisout, 1848, Ann. Soc. Ent. France, (2), VI 424, Jakobson, 1905:208, plate VII, Uvarov, 1927a: 204, Figure 272 (Acrydium), Tarbinskii, 1940.35, 219, Figure 169 (Acrydium).

101 7. Genus Clinotettix B.-Bienko

Bei-Bienko, 1933, Bol. Soc. Espan. Hist. Nat., XXXIII:327.

Close to Tetrix Latr., but differs in the following features. The body is relatively very big. Frons strongly slanting, forming with the vertex an acute angle, the vertex projects strongly forward between the eyes (Figure 59); the length of the projecting part more than half the length of the eye as seen from above; the frontal ridge seen from above is completely covered by the projecting vertex; the uneven dorsal section of the frontal ridge is long, extending from the fastigium to half the distance between it and the level of the antennae. The pronotum is flat dorsally, only slightly roof-shaped anteriorly between the transverse grooves; the median carina is low, effaced in front of the anterior margin; the prozona square; the posterior process extends over hind genua; the posterior ventral angle of the lateral lobes on the apex below broadly rounded, but its posterior oblique margin forming with the rounded part an obtuse angle (Figure 59). The wings extend somewhat over the posterior process of the pronotum; the anterior field (between the anterior margin and R) wide, not narrower than the posterior adjoining field (between R and Cu) and middle femora. All femora with entire margins, rather narrow.

Only one species is known.

1(1). The antennae thick, 15-16 segmented, brownish-yellow, on the apex black and with a pointed terminal segment, the middle segments not more than twice longer than they are wide. The frontal ridge between the eyes slightly concave in profile (Figure 59) Pulvillae on the first segment of the hind tarsi weakly incised, on the apex without a produced point. The total length ♀ 18-19, that of the hind femora 7.4-7.7 mm, ♂ unknown. —South-Ussuri Territory, Manchuria (!). . . . .*1. C. ussuriensis B.-Bienko.

Bei-Bienko, 1933, Bol Soc Espan Hist Nat, XXXIII 329, Figures 9-10

8. Genus Formosatettix Tinkh.

Tinkham, 1937, Trans Nat Hist Soc Formosa, XXVII 237
Type of genus: F arisanensis Tinkh, Taiwan.

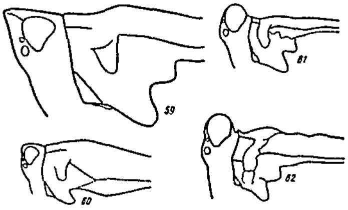
Close to the genus Tetrix Latr. and differs merely in the following characteristics. The prozona of the pronotum with lateral carinas converging backwards, the posterior margin of the lateral lobes of the pronotum only with one ventral notch but without a wing notch (Figure 60) The lateral ventral sides of the process of the pronotum are strongly enlarged in the basic part, and cover the body from the sides. Tegmina and wings are very shortened, practically absent, hidden under enlarged lateral sides of the process of the pronotum.

As to structure of the pronotum and absence of the visible tegmina the species of this genus very much resemble the larvae of the genus Tetrix Latr., but are easily distinguished from the latter by the serrated valves of the ovipositor and the absence of visible rudiments of wings.

To this genus Tinkham (cited publications) assigned only two species from Taiwan, but F formosanus Shir. must also be added. This species has been described as representative of the genus Tettix and also a species from Japan closely related to it which is described below All these 4 species represent a natural entirety and correspond completely to the above diagnosis of the genus.

Only one species, characteristic for Japan, is described below

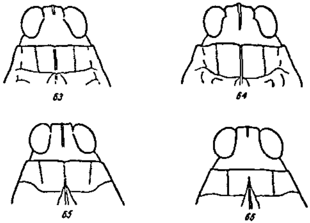
102 1(1). The antennae not less than twice the length of the anterior femora, the middle segments 4-5 times longer than they are wide. The vertex anteriorly is very slightly elevated between the eyes, the frontal ridge with a weak notch in front of the lateral ocelli in profile (Figure 60). The pronotum dorsally sharply roof-shaped with a distinctly elevated median carina, the lateral carinae sharp, extending forward over the humeral angle which is easily distinguished Oblique angle on the lateral aspects of the process of the pronotum absent. The total length ♂ 10.5, ♀ 11 0-12.5 mm, the hind femora ♂ 7.1, ♀ 8.1-8 3 mm —Japan mountains near to Tokyo (Tsuruga and Takao-san (♀ type)) . . . . 1. F. larvatus B.-Bienko sp n.



Figures 59-62
(Original)

Figures 59-62. Head and anterior part of pronotum, from the side.
(Original)

59—Clinotettix ussuriensis B.-Bienko, ♀, 60—Formosatettix larvatus B.-Bienko, sp. n., ♀ (type); 61—Euparatettix insularis B.-Bienko sp. n., ♂ (type), 62—Ergatettix dorsiferus (Walk.), ♀ (Termez).



Figures 63-66. Head and prozona of pronotum, dorsally. (Original)

63—Paratettix meridionalis (Ramb.), ♀ (Algiers), 64—P. uvarovi Sem., ♀ (Termez), 65—P. obliteratus iranicus B.-Bienko subsp. n., ♀ (Kerman, paratype), 66—P. histricus (Stål), ♀ (southeastern Iran).

9. Genus Mesotettix B.-Bienko gen n.

Type of genus: M brachypterus (Luc.), North Africa

As Tetrix Latr., but the frontal ridge between the antennae is more enlarged, considerably wider than the first antennal segment. The posterior edge of the lateral lobes of the pronotum with only one ventral notch and without a wing notch, the lateral aspects of the process of the pronotum are very enlarged at the base. Tegmina and wings are very atrophied, practically absent. The anterior and especially the middle femora with strong lamellar lobes along the ventral margin, the first segment of the hind tarsus is almost twice the length of the third.

In the structure of the pronotum and atrophied wing organs the genus is similar to Formosatettix Tinkh., and the frontal ridge especially resembles Neotettix Hanc., from the southeastern part of North America; the latter-mentioned feature shows that this genus is close to the representatives of the subfamily Cladonotinae.

Only two species are known, spread in the Mediterranean countries, only one species is given below.

103 1(1). The vertex in profile projects markedly forward between the eyes, the frontal ridge with a distinct notch in front of the lateral ocelli. The pronotum sharply roof-shaped, moderately coarse, strongly arcuate in profile, the anterior margin projecting in the form of an acute angle, the posterior process reaches the dorsal end of the hind femora. The hind femora 3 times longer than they are wide, with robustly projecting tubercles outside. The length ♂ and ♀ 7-9 mm, that of the hind femur 6 mm. —Syria, Iberian Peninsula. Was incorrectly considered by some authors as a synonym of *M. brachypterus* (Luc.) from North Africa . . . . 1. M. nobrei (Bol.)

Bolivar, 1887, Anal. Soc. Esp. Hist. Nat., XVI 99, tab. IV, Figure 10 (Tettix) 1887 262 (Tettix) —brachyptera Jakobson, 1905 208 (Tetrix) (partim)

10. Genus Paratettix Bol.

Bolivar, 1887:270 Jakobson, 1905:211 Hancock, 1906, Gener. Ins, fasc 48, Orth Tetrig :35 1915, Rec. Indian Mus, XI 111

Type of genus P meridionalis (Ramb).

The antennae 14-15 segmented, inserted between the eyes or lower than the level of the ventral margin of the eye The eyes moderately convex, do not project or project slightly over the level of the pronotum, the vertex not wider or narrower than the eye, its anterior margin seen in profile as well as from above does not project forward between the eyes (Figures 63-66), the frontal ridge between the antennae projecting in profile but lowered or concave between the eyes The pronotum anteriorly trimmed, posteriorly normally continuing into a long process extending over the hind genua, the median carina low, not arcuate in profile, often obsolete at the anterior margin, the prozona markedly transverse, not less than 1 5-twice wider

than its length (Figures 63-66). The wings normally extend considerably beyond the apex of the process of the pronotum. The middle tibiae sometimes narrowed at the apex.

There are a great number of almost exclusively tropical species, spread over all parts of the world, and often differing considerably from the type of the genus. Only 4 species are given below.

1(6). Anterior and especially middle femora with wavy margins (Figure 57); the middle femora wide, not narrower than the visible part of the tegmina; the dorsal carina of the hind femora (not reaching the pregenicular part) with a projecting lobule. The antennae are inserted partly or completely lower than the eyes; the middle segments 2-4 times longer than they are wide. The body wider at the level of the shoulders.

2(5). The pronotum with sharp median and lateral carinas; its apex often with a few heterogeneous tubercles. The posterior angle of the lateral lobes of the pronotum with a symmetrically rounded apex. The anterior margin of the mesosternum in the middle part (behind the oral organs) straight. The antennae reach the bases of the middle femora; the middle segments 3-4 times longer than their width.

3(4). The vertex seen from above considerably narrower than the eye (Figure 63). The antennal depressions are situated not less than half the height of the level of ventral margin of the eyes. The median carina of the pronotum greatly lowered at its anterior edge and here almost
104 obsolete. Smaller. The total length ♂ 10.0-11.3, ♀ 11.5-14.0 mm; the hind femora ♂ 4.4-5.0, ♀ 5.4-5.6 mm. —Mediterranean countries including North Africa; indications as to occurrence in U.S.S.R. are relevant for the next species. 1. P. meridionalis (Ramb.)

Rambur, 1838, Faune Ent. Andalus, II 65 (Tetrix), Bolivar, 1887:275, Figure 23, Jakobson, 1905:211 (partim), Uvarov, 1927a:204 (partim, but including figures).

4(3). The vertex equal in width to that of the eye or a little wider (Figure 64). The antennal depressions are almost completely situated lower than the level of ventral margin of the eyes. The median carina of pronotum at its anterior margin usually not obsolete. Bigger. The total length ♂ 11.6-13.0, ♀ 12.5-14.0 mm; the hind femora ♂ 4.8-5.6, ♀ 5.3-6.0 mm. —Transcaucasus, the whole Middle Asia, with exception of mountains and southern Kazakhstan to lower parts of the River Syr Darya, valley of Ili River and Lake Ala Kul; northern Iran. Sandy banks of rivers and sands. (Was formerly confused with the preceding species . . . . *2. P. uvarovi Sem.

Semenov, 1915, Russkoe entomologicheskoe obozrenie, XV:451. —meridionalis Uvarov, 1927a:204 (partim, excluding figures), Tarbinskii, 1940:220 (not Rambur).

5(2). The pronotum with weak median and lateral carinas, above without tubercles; in the prozona the lateral carinas are hardly distinguishable, posteriorly converging, and do not reach the anterior transverse groove; the median carina at the anterior margin is completely effaced. (Figure 65). The posterior ventral process of the lateral lobes of the pronotum rounded bluntly on the apex and posteriorly

5 slightly obtuse-angled. The anterior margin of mesosternum in the middle part slightly concave backwards. The antennae do not reach the bases of the middle femora, the middle segments at least in ♀, only 2-3 times longer than they are wide. . . . . *3. P. obliteratus B.-Bienko sp. n.

a(b). Smaller. The middle segments of the antennae in ♀ hardly twice longer than they are wide, in ♂ twice longer than their width. The total length ♂ 10.7-11.5, ♀ 12.5 mm, the hind femora ♂ 4.8-5.2, ♀ 5.5 mm. – South Transcaucasus· Araks River valley at Ordubad (♀ type). . . . *3a. P. obliteratus obliteratus B.-Bienko subsp. n.

b(a). Bigger. The middle segments of the antennae in ♀ almost 3 times, in ♂ 3-4 times longer than they are wide. The total length ♂ 12.0-12.5, ♀ 13-15 mm, the hind femora ♂ 5.4-5.6, ♀ 6.2-7.0 mm. —Iran· Luristan, Khuzistan, Kerman (♀ type from Bazman) and Beluchistan . . . . 3b. P. obliteratus iranicus B.-Bienko subsp. n.

6 (1). The anterior and middle femora with straight ventral margins, the dorsal carina of the hind femora without distinct lobule in front of pregenicular part, hind femora narrow, considerably narrower than visible part of tegmina. The antennae are inserted between the ventral parts of eyes, long, very thin, the middle segments 6 times longer than their width. The body is narrow at the level of the shoulders, slender The vertex is not wider than the eye, the middle carina of the pronotum at its anterior margin is lowered and obsolete (Figure 66). The total length ♂ 12.0-14.8, ♀ 14.5-18 0 mm, the hind femora ♂ 5.0-6.2, ♀ 6.0-7.1 mm. —Southern and eastern Iran (Khuzistan, Beluchistan and Seistan'), eastern Afghanistan, Arabia (Oman!), India, Malay Archipelago, Philippine Islands, Taiwan, South China, Australia, East Africa (Kilimanjaro). Very variable in dimensions of the body and other characteristics and described by many authors under various names . . . . 4. P. histricus (Stål)

Stål, 1860, Kongl. Freg. Eugenias Resa, Zool., V, Orth. 347 (Tettix). —Bolivar, 1887 279 (Paratettix) Gunther, 1937, Rev. Suisse Zool., 44.133, Figure 14 (Euparatettix). —variabilis Bolivar, 1887 276 (Paratettix) —corpulentus Hancock, 1912, Mem. Dept. Agric. India, IV 158 (Euparatettix) —?ocellatus Uvarov, 1936, Linn. Soc. Journ., Zool., XXXIX:552.

11. Genus Euparatettix Hanc

Hancock, 1904, Spolia Zeylan., II 145 Kirby, 1914.57 (partim) Gunther, 1937, Treubia, 16 175. Type of genus E. personatus (Bol.), Indo-Malayan area

Same as Paratettix Bol., but the antennae always long, thin, attached completely or partly between the eyes, the eyes very convex and project considerably over the level of the pronotum, the lateral ocelli are located in front of the middle of the eye (Figure 61), the vertex always narrower than the eye, the frontal ridge forms a convex arc in profile extending from the fastigium to the middle ocellus, the prozona of the pronotum short, very transverse, 3-4 times wider than its length, all femora with straight, non-wavy margins, middle femora moderately but markedly narrower than visible part of tegmina, the middle tibiae do not taper at the apex.

A small number of species which are spread in Indo-Malayan and partly Australian regions; a single species reaches Taiwan in South China and one species described below is spread in Japan.

With regard to its characteristics the species of the genus Euparatettix Hanc. above all resemble those species of the genus Paratettix Bol., having a slender body, narrow middle femora and antennae inserted between
106 the eyes, as for example P. histricus (Stål). On the other hand there is a great resemblance also to the species of the genus Ergatettix Kirby; this especially concerning the below-described Japanese species which was wrongly indicated as found in Japan under the name Paratettix (or Euparatettix) histricus (Stål) and then mistakenly assigned by Hebard (1929) to the genus Ergatettix.

1(1). The base of the antennas is located one half lower than the level of the ventral margin of eye (Figure 61). The frontal ridge between the bases of the antennas considerably projects in profile in the form of a very rounded obtuse angle rather than a regular arc, completely straight over the bases of the antennas, lower than those which are concave obtuse-angled. (Figure 61). Ventral margin of the anterior and middle femurs with sparse cilia. The hind femurs not black inside; the hind tibias brown with a bright ring at the base and with a suggestion of a bright belt behind the middle. The median carina of the pronotum slightly wavy; the posterior lower angle of the lateral lobes is quite broadly rounded. (Figure 61). The total length ♂ 11.5, ♀ 12.5 mm; the hind femurs ♂ 4.0-4.5, ♀ 4.6-5.0 mm. —Japan (♂ type, Sagami Peninsula, Honshu Island), Ryukyu Islands . . . . 1. Eu. insularis B.-Bienko sp. n.

—histricus Shiraki, 1906, Trans. Sappora Nat. Hist. Soc., I, 2:7 (Paratettix) (nec Stal); Hebard, 1924, Trans. Amer. Ent. Soc., L:210 (Euparatettix) (nec Stal).

12. Genus Ergatettix Kirby

Kirby, 1914:69, Hebard, 1929, Rev. Suisse Zool., 36:587.—Indatettix Hancock, 1915, Record Ind. Mus., XI:127; Gunther, 1937, Treubia, 16:175.—Euparatettix Kirby, 1914.57 (partially).

Type of genus: E. dorsiferus (Walk.).

Close and similar in appearance to Euparatettix Hanc., differing only in the following characteristics. The antennae inserted almost completely below the level of the ventral margins of the eyes; the frontal ridge projects in profile only between the bases of the antennae forming a convex arc only between the lateral and median ocelli (Figure 62). The median carina of the pronotum distinctly, often very wavy in profile. The middle femurs wide flattened much wider than the anterior femora, not narrower or hardly narrower than the visible part of the tegmina; ventral margin of the middle femora often moderately wavy, always with a regular row of long setae which occur also on the ventral margin of the anterior femora but do not form such regular rows; the middle tibia with setae on ventral and partly on dorsal margins, in the basal part slightly enlarged, visibly tapering at the apex. The hind femora outside often very coarse and with irregular tubercle-shaped inflations.

A small number of species which are spread in Indo-Malayan area; one species enters the U.S.S.R.

All known species have been insufficiently investigated and are characterized by a great variability of the external features, especially by different degrees of coarseness of the body which makes precise identification very difficult. The species E. dorsiferus (Walk.) which is described below is very widely spread and possibly is a heterogenous one; however this may be elucidated only by means of investigation of abundant material from different parts of the areal.

1(1). Brownish or dirty-black. Inside of hind femurs dark, sometimes almost black; the hind tibiae with a dark apex; the third pulvilla of the hind tarsi longer than the second one. The pronotum between the shoulders with 2 at least weakly developed additional short carinas; the lateral
107 carinas often with a tubercular inflation over the place of derivation of the oblique carina (i.e., a little posteriorly to apex of tegmina); the median carina usually slightly wavy (Figure 62). The total length of ♂ 10.0-11.5, ♀ 11.8-14.5 mm; the hind femora ♂ 4.0-4.3, ♀ 4.6-5.0 mm. —Southern part of Middle Asia· Turkmenia (Kerki), Uzbekistan (Termez!); Tadzhikistan (Pyandzh River valley); Afghanistan, southeastern Iran (Kerman!), India, Ceylon, continental China in the north to Kansu Province, Taiwan .... *1. E. dorsiferus (Walk.) ....

Walker, 1871, Cat. Dermapt. Salt. Brit. Mus., V:825 (Tettix). Kirby, 1914 63, Figure 55 (Paratettix); Hebard, 1929, Rev. Suisse Zool., 36:588, B.;Bienko, 1933, Ark. Zool., 25A, No. 20:12.—parvus Hancock, 1905, Spol. Zeylan., II:145 (Euparatettix).—pilosus Hancock, 1909, Trans. Ent. Soc. Lond.:410 (Euparatettix).—tarsalis Kirby, 1914.70, Figures 62-63.—siasovi Morits, 1928, Materialy obsledovaniya saranchevykh severnoi Persii, Ashkhabad:50 (Paratettix).

II. Family EUMASTACIDAE

(= MASTACIDAE, CHOROTYPIDAE)

(Compiled by G. Ya. Bei-Bienko)

Body often laterally compressed, in some tropical representatives often of unusual form and composition, in vivo often with metallic tinges. Head very short (Figures 67, 69, 85), frons usually strongly sloping, more rarely (in some mountainous species) almost vertical, vertex roundly passes into frons or projects anteriad between eyes, sometimes with a process, foveolae absent. Antennae very short, filiform, not longer, usually shorter than fore-femur, not more than 14-15 segmented, or in subfamily Gomphomastacinae often longer in ♂ club-shaped, and then consisting of 15-25 segments (Figures 72-74). Third to fifth segment, taken from apex of antenna, has a special antennal organ in the shape of a small triangular process or spinule on ventral surface (Figures 81, 82, 90), more rarely this organ is absent, bases of the antennae separated at least somewhat more than lateral ocelli (Figures 70, 86). Pronotum short, shaped differently, in the majority of cases cylindrical, saddle-shaped or moderately roof-shaped,

with slightly elevated, sometimes almost vanishing median carina; only in subfamily Chorotypinae (tropical Asia and Africa) median carina is distinctly elevated and lamellar. Prosternum simple, without a process, meso- and metasternum well-marked, with a common, usually rounded or quad-
108 rangular plate, the posterior margin of which is incised at an angle (Figures 83-84). Tegmina and wings very often completely absent; if completely developed then tegmina in front of middle narrowed, further on apically expanded, apex itself rounded or obliquely truncate. Fore- and mid-femora dorsally on both margins with a distinct carina; more rarely fore-femora only with one median carina (subfamily Erianthinae); hind femora usually slender, more rarely strongly expanded, short, laterally compressed (subfamily Chorotypinae); base of femur at place of articulation with trochanter which has a strongly projecting pointed ventral lobe and a weakly developed, shorter dorsal lobe; ventral surface of femur near base, further in than ventral median carina, carries a small papilla-shaped tubercle (Brunner's organ). There are 3 dorsal carinas, usually armed with small spinules and in the majority of cases ending at the distal end of femur with distal spines; genicular lobes are also usually armed with a spine. Hind tibiae with an outer apical spine; spines of inner row being significantly longer than outer spines, and often different in length. All tarsi 3 segmented; first segment of hind tarsus dorsally on both marginal carinas with denticles or (in subfamily Eumastacinae and others) without denticles; claws of tarsi often asymmetrical (Figures 78-79) with longer posterior (inner) claw, empodium between claws always present, often also asymmetrical. Abdomen without tympanic organ on sides of first segment; tip of abdomen in some tropical genera swollen or with genital appendages of complicated structure. Ovipositor free, dorsal valves on dorso-outer margin usually being finely serrated (Figure 87).

Locusts and grasshoppers of this family are characteristic of forest areas of the tropical belt, where many species probably inhabit trees and bushes. Within the limits of the U.S.S.R. these insects are found only in Middle Asia where they remained in conditions of mountainous landscape as a remnant of fauna of the Tertiary period. A small number of species is also known from Japan, Central China, Kashmir and Afghanistan. Twenty-eight species, belonging to 10 genera and 4 subfamilies, are described below.

Key to Subfamilies and Genera of Family Eumastacidae

1 (18). First segment of hind tarsus with spinules on both dorsal margins; if there are only 1-2 spinules on outer margin then frontal ridge in ventral half barely discernible or completely absent.

2 (3). Frontal ridge beneath median ocellus almost or completely unmarked, often expanded between antennae; median ocellus situated significantly above the level of ventral margin of eyes. Tegmina and wings completely developed or absent. (1. Subfamily Erianthinae). —Vertex with a triangular pointed process directed upwards (Figure 67). Head anteriorly flat, vertical; frontal ridge between antennae strongly and roundly expanded. Hind tibiae normal, without a lobe at base. Tegmina and wings completely developed . . 1. Erianthus Stål.

3 (2). Frontal ridge well marked, stretching from fastigium to clypeus, with a strong groove (Figures 70, 86); median ocellus situated

approximately at the level of ventral margin of eyes. Tegmina and wings absent.

4 (5). First abdominal segment without lateral carinas. Antennae shorter than fore-femora, filiform, 9-11 segmented. (2. Subfamily Episactinae) —Antennae completely filiform, 9 segmented. Subgenital plate in ♂ short, with notch in the middle (Figure 68), in ♀ apically incised, with 2 short lobes . . . . 2. Pielomastax Chang.

5 (4) First abdominal segment with lateral carinas situated behind ventral margin of metanotum. Antennae 11-25 segmented, at least in ♂ somewhat longer than fore-femora, often apically expanded, in ♀ sometimes the same length as fore-femora (Figures 71-74). (3. Subfamily Gomphomastacinae).

109 6 (7). Antennae 11-12 segmented, rather wide, slightly flattened (Figures 71-81). Pronotum roof-shaped, with distinctly elevated, slightly lamellar median carina and almost parallel lateral carinas, not reaching posterior margin; lateral lobes with a distinct, regular, oblique carina (Figure 69). Vertex wide, projecting forward between eyes, forming a distinctly marked angle with the frons (Figure 69) . . . . 3. Clinomastax B.-Bienko.

7 (6). Antennae 13-25 segmented, cylindrical, in ♂ slightly club-shapedly expanded apically (Figures 72, 74). Pronotum cylindrical, with irregular and indistinct lateral carinas or without them, median carina weak, obtuse; lateral lobes without distinct oblique carina, sometimes only with a weak, irregular carinal fold.

8 (9). Vertex anteriorly with a strong notch and when seen from above seems bi-fastigial. Antennae 14 segmented. Pronotum very short, transverse. Occiput, pro- and metanotum rugose . . . . .4. Brachymastax Rme.

9 (8). Vertex anteriorly slightly rounded or concave, when seen from above not divided in two processes. Antennae 15-25 segmented (Figures 72-74), if they are 12-14 segmented then vertex strongly projects anteriorly between eyes and in profile forms a distinct angle with front.

10(17). Both claws of tarsi of completely identical length, empodium always significantly shorter than claws (Figures 75-77)

11(12). Vertex distinctly projects forward between eyes, when seen from side forms a distinctly marked right or slightly acute angle with the frons. Frontal ridge not projecting anteriorly between bases of antennae. Antennae 12-14 segmented 5. Oreomastax B.-Bienko.

12(11). Vertex does not project or hardly projects anteriorly between eyes, in profile roundly passes into the frons or forms an indistinct obtuse angle with it. Frontal ridge projects anteriorly between bases of antennas. Antennae 15-25 segmented (Figures 72-74).

13(14). Antennae 15-18-segmented (Figure 72) Hind femora dorsally without distal spines on distal end. Frontal ridge on level of lateral ocelli somewhat narrowed, between antennae strongly expanded, further ventrad narrowed again (Figure 70) . . . . .6. Paedomastax C. Bol.

14(13). Antennae 22-25 segmented (Figures 73-74) Hind femora end dorsally with 1-3 distal spines Frontal ridge in dorsal part strongly narrowing ventrad till the level of lateral ocelli, farther on ventrad almost with parallel margins or slightly expanded between antennae (as in Figure 86)

15 (16). Body strongly swollen in the thoracic area, from here distinctly narrowing anteriorly and posteriorly; pronotum strongly expanded caudad, with widely-separated laterally posterior parts of lateral lobes (Figure 80). Median carina of meso- and metanotum distinctly elevated, with a thin longitudinal groove. Frontal ridge expanded between antennae. . . . . .7. Pachymastax B.-Bienko.

16 (15). Body not swollen in thoracic area, pronotum cylindrical or slightly expanded caudad (Figure 85). Median carina of meso- and metanotum moderately elevated, without a thin groove. Frontal ridge beneath the level of lateral ocelli gradually narrowing ventrad or al-
110 most with parallel margins (as in Figure 86). . . . . 8. Phytomastax B.-Bienko.

17 (10). Claws of tarsi asymmetrical because posterior claw (i. e., outer on fore tarsi, inner on remaining tarsi) markedly longer than the opposite one; empodium between claws large, not shorter or hardly shorter than lesser claw (Figures 78, 79). Antennae 19-25 segmented (Figure 74). Hind femora dorsally with three distal spines. . . . . 9. Gomphomastax Br.-W.

18 (1). First segment of hind tarsus without spinules on dorsal aspect (4. Subfamily Eumastacinae). —Tegmina and wings completely developed, apex of tegmina obliquely truncate. Antennae 11-segmented. Spines of inner row of hind tibiae homogenous, without distinctly distinguishing long spines. . . . . 10. China Burr.

1. Subfamily ERIANTHINAE

Antennae shorter than fore-femora, not more than 15-segmented. Head often anteriorly flat; frontal ridge in some places with weakly marked or interrupted carinae, especially in ventral half of front, often expanded between antennae; median ocellus situated significantly above the level of ventral margin of eyes; vertex at least anteriorly with a weak process between eyes; this process is often strong, apically pointed (Figure 67). Pronotum normal, cylindrical, not pointed anteriorly and not extending onto head (Figure 67); median carina only sometimes moderately lamellar. Tegmina and wings present or absent. Hind femora normal, not expanded lamellarly; first segment of hind tarsus with spinules on both dorsal margins (only in genus Mnesicles Stål from Malay Archipelago with 1-2 spinules on outer margin). Abdomen in ♂ often strongly specialized at tip.

A small number of genera distributed in southeastern Asia; some genera are known from tropical Africa and North America, one genus (Erianthus Stål) reaches the central part of China and Japan in the north.

1. Genus Erianthus Stål

Stål, 1876, Ofv. Vet. Akad. Förh., Stockholm, 3 55; Burr, 1903, Gen. Insect., fasc. 15, Orth. Eumast.:7; Kirby, 1914 86, C. Bolivar, 1930:123.

Type of genus: E. guttatus (Westw.), southeastern Asia.

Head anteriorly flat, vertical; fastigium directed dorsad in shape of a triangular-pointed process (Figure 67); frontal ridge between antennae strongly roundly expanded. Pronotum with an elevated, in ♀ lamellar median carina. Tegmina and wings completely developed; tegmina narrowed before middle, farther on apically expanded, apex obliquely cut; wings elongatedly triangular. Fore-femora with a strong longitudinal median carina on dorsal aspect, hind femora slender; the dorsal carina ends on distal end of femur with a sharp triangular tooth; hind tibiae normal, without a triangular lobe at base. Abdomen in ♂ swollen at tip, with a bilobate anal plate, a titillator (a pair of processes on the sides of ventral part of tip of abdomen) long, stout, irregularly curved, apically expanded and partially lamellar, last sternite (subgenital plate) of abdomen in ♀ bilobate.

111 Over 10 species are known, distributed from Ceylon and Burma to the Malayan Archipelago, only one species is known from Taiwan, one enters into southern and Central China and one is described from Japan

Fastigium projects in the shape of a short rectangular process, the length of which in ♀ does not exceed half the length of eye, posterior surface of process slightly convex, without a notch (Figure 67). Tegmina apically obliquely truncate, with two light spots in apical half.

1 (2). Process on vertex shorter than half of length of eye (Figure 67). Frontal ridge between antennae expanded in shape of strongly elongated oval, median part of latter with almost parallel lateral carinas. Pronotum anteriorly truncate, its median carina low, linear (Figure 67). Anal plate in ♂ with 2 short lobes, which are divided by a long incision. Cerci in ♂ at base stout, conical, at apex with a long thin process directed inward. Titillator in ♂ stout, apically lamellar and bent dorsad. Hind femora with dark bands. Length ♂ 18-23, ♀ 30-33 mm, hind femur ♂ 11.5-13.0, ♀ 16.5 mm —Southern and Central China, in the north up to Chekiang Province, Indo-china and Burma . . . . 1. E. versicolor Br.-W.

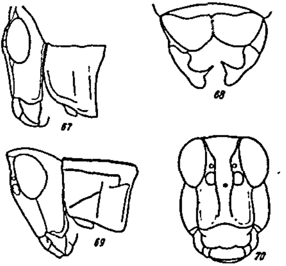
Brunner-Wattenwyl, 1898, Abhandl Senckenb. Nat Ges , XXV 224, Figure 30 C Bolivar, 1930 123 Crang, 1937, Not. Ent. Chinoise, IV, 3:37 —flavipes Saussure, 1903, Reg Suisse Zool., XI 79. —dohrni tonkinensis C Bolivar, 1914, Trab. Mus. Nac. Sc. Nat., Zool , 16 7, 9

2 (1). Process on vertex in ♀ is half the length of the eye. Frontal ridge between antennae elongatedly pyriform. Pronotum anteriorly with distinct median notch, median carina slightly sinuous Subgenital plate in ♀ sharp, with a median groove. Hind femora with 3 dark bands. Length ♀ 30, hind femur 15 mm, ♂ unknown —Japan Nippon [Honshu] Island . . . . 2 E. nipponensis Rehn.

Rehn, 1904, Proc. Acad Nat Sc. Philad , LIV 672.

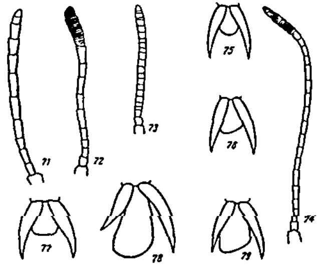
2. Subfamily EPISACTINAE

Antennae shorter than fore-femora, filiform, more rarely slightly expanded apically, 9-11-segmented. Head anteriorly not flat, frontal ridge well marked on its whole extent and stretching from fastigium to clypeus,



Figures 67-70
(Figure 68 according to Chang, the rest original)

67—Erianthus versicolor (Br.-W.), ♂, head and pronotum, from the side (Tonking), 68—Pielomastax soochowensis Chang, ♂, genital plate and cerci, ventrally, 69—Clinomastax ninae (Mistsh.), ♂, head and pronotum, from the side, 70—Paedomastax avinovi (Uv.), ♂, head, front view (paratype).



Figures 71-79
(Original)

71—Clinomastax ninae (Mistsh.), ♂, antenna; 72—Paedomastax avinovi (Uv.), ♂, ibid. (type); 73—Phytomastax opaca (Kr.), ♀, ibid. (Przhevalsk), 74—Gomphomastax juniperi B.-Bienko, ♂, ibid. (paratype), 75—Oreomastax morosa (Mistsh.), ♀, empodium and claws on tarsus, 76—Phytomastax opaca (Kr.), ♀, ibid.; 77—Ph. artemisiana B.-Bienko, ♀, ibid. (paratype), 78—Gomphomastax clavata (Ortr.), ♀, ibid. (Alma-Ata), 79—G. shaitaikovi B.-Bienko, ♀, ibid. (paratype).

with a strong groove, median ocellus situated at level of ventral margin of eyes. Pronotum cylindrical, sometimes with lateral carinas; tegmina and wings absent. Fore-femora with 2 carinas on dorsal aspect, fore-tibiae ventrally with 2 rows of spinules in apical half, first segment of hind tarsus with spinules on both dorsal margins. Abdomen in sides of first segment without longitudinal carina Cerci and subgenital plate in ♂ sometimes specialized.

A small number of genera, peculiar to Central and partly to South America, one genus is known from China.

2. Genus <u>Pielomastax</u> Chang

Chang, 1937, Not. Ent. Chinoise, IV, 3 40
Type of genus <u>P octavii</u> Chang, southern China

Antennae 9 segmented, filiform, third segment mostly long, almost of the same length as first and second segments, preapical segment with a small spinule on apex of inner aspect Head with a sloping frons, frontal ridge on dorsal margin with parallel sides, wider between antennae than
112 near the fastigium, with a constriction near median ocellus, vertex short, wide, roundly passing into frons Pronotum with weak, in ♂ almost parallel lateral carinas, posterior margin with a triangular notch in the middle, lateral lobes with a distinct arcuate notch in dorsal part of posterior margin Fore-femora on dorsal aspect between carinas flat, carinas end on apex with a short denticle, hind femora with spinules on all 2 dorsal carinas and with a denticle on end of each carina Hind tibiae on inner dorsal margin with spines of different lengths, 4 apical spines narrowed and converging and markedly shorter than preceding spine. Cerci in ♂ slightly compressed laterally, rather long, in apical half bent inward (Figure 68), subgenital plate in ♂ short, with an angular notch in the middle of posterior margin, in ♀ elongated, on apex incised, with 2 short narrow apically rounded lobes. Valves of ovipositor elongated, dorsal pair with small denticles on dorsal outer margin, ventral pair with few teeth on outer ventral margin and with short small tooth on base of inner margin

Only 2 species are known, one of which reaches Kiangsu Province in the north

113 This genus somewhat resembles Middle Asian Gomphomastacinae externally and is regarded by its author (Chang, 1937) as being a close relative of <u>Gomphomastax</u> Br -W , but according to the sum of its features it is closer to the Central American genera belonging to the subfamily Episactinae.

Only one species is considered below, is incorrectly indicated as being from the Soochow region in Kiangsu Province under the name <u>Gomphomastax clavata</u> (Ostr)

1 (1) First segment of hind tarsus with 4 (sometimes 5) spinules on outer dorsal margin and with 5 (sometimes 4) on inner margin. Cerci medially narrowed in ♂, in front of apex with a long thin spine from inside, directed ventrad (Figure 68). Length ♂ 18-20, ♀ 22.5-26.0 mm, hind femur ♂ 10-11, ♀ 12.0-14.2 mm —Chekiang and Kiangsu

provinces in Central China . . . . 1. P. soochowensis Chang.

Chang, 1937, Not. Ent. Chinoise, IV, 3:45, Figures 3, 6.

3. Subfamily GOMPHOMASTACINAE

As Episactinae, but antennae longer, 11-25 segmented, in ♂ always often more than twice longer than fore-femora, apically club-shapedly thickened, or at least slightly expanded, in ♀ equal to fore-femora or longer (Figures 71-74). First abdominal segment on sides with a distinct longitudinal carina, situated on the level of ventral margin of metanotum. Cerci in ♂ simple, cylindrical, almost straight. Subgenital plate in ♂ strongly bent upward, shortly conical but without a notch in the middle of the posterior margin and without additional structures; subgenital plate in ♀ with 1 or 3 cusps at the end or rounded but without median incision (Figures 88-89).

Altogether 7 genera are known, limited in their distribution by mountains of Middle Asia, western Himalayas and northern Hindu Kush; one species not determined is indicated for southwestern Tibet. In all this teritory it is possible to find new, still unknown genera and species of the given subfamily.

3. Genus Clinomastax B.-Bienko

Bei-Bienko, 1949a:734.

Antennae short, 11-12 segmented (Figure 71), in ♂ not more than 1.5 times, in ♀ hardly longer than fore-femora; antennae flattened, wide; apically only in ♂ barely discernibly expanded but in both sexes thickened ventrally; *tenth segment ventrally with an antennal organ in the shape of a* pointed tubercle (Figure 81), which is more marked in ♀. Head with a sloping frons, fastigium wide, with a distinct median carina, reaching also to the occiput, strongly projecting anteriorly between eyes, forming a distinctly marked slightly pointed or almost right angle with frons (Figure 69); frontal ridge expanded only at fastigium, in remaining part with almost parallel carinae, when seen from side not projecting or in ♂ slightly projecting forward between antennae. Pronotum dorsally roof-shaped, with distinct, almost parallel lateral carinae, not reaching its posterior margin and with an oblique carina on lateral lobes, extending from ventral part of anterior margin of lobes to dorsal part of their posterior margin on the
114 level of the lateral carinas (Figure 69); posterior margin of pronotum with a strong angular notch. Meso- and metanotum with a strong median carina, continuing also on abdomen, also with weak, in ♂ semi-obliterated lateral carinae which are a continuation of carinas of pronotum and pass onto first abdominal tergite in a very weakened shape. Longitudinal carina along ventral margin of first abdominal tergite distinct, sharp, reaching posterior margin of tergite. Cerci in ♂ simple, cylindrical; subgenital plate in ♂ shortly conical, in ♀ posteriorly projecting at an angle. Dorsal valves of ovipositor with wide, lobe-shaped teeth on dorsal margin, without separated

hook-shaped end, ventral valves in basal half with lamellar outer margin, farther on with a distinct notch, with a weak tooth on the base of the inner margin. All femora without distinct spines on end; hind femurs short, stout, with single spinules only on dorsal median carina. Tarsi with symmetrical claws, empodium between them half the length of the claw itself.

According to its flattened antennae, which are only 11-12 segmented, the structure of its thorax, and dorsum, the lateral carinas of which continue till the first abdominal tergite, this genus differs distinctly from all other representatives of the subfamily Gomphomastacinae, and is highly similar to genus Episactus Burr (subfamily Episactinae) from high mountainous regions of Central America and Southern Mexico. This similarity is increased by the fact that both the mentioned genera have an identical structure of vertex, although an analogous type of vertex is present also in so certain a representative of the subfamily Gomphomastacinae as genus Oreomastax B.-Bienko. Only the presence of lateral carinas along the ventral margin of the first abdominal tergite (not to be confused with rudiments of the lateral carinas, situated at the sides of the dorsal aspect of the tergite which are a continuation of carinas of pro-, meso- and metanotum) in genus Clinomastax, allows inclusion of this genus in subfamily Gomphomastacinae.

At present only one species in known, distributed in Tadzhikistan.

1 (1). Grayish-straw colored. Antennae darkened apically or only with a darker ventral surface of apical segments (Figure 81). Hind femora 4.3-4.5 times longer than their width. Hind tibiae with 13-16 inner and 18-20 outer spines. Subgenital plate in ♀ posteriorly with a short angular median lobe and 2 shorter obtuse processes on the sides. Length ♂ 12.5-13.5, ♀ 22-24 mm; hind femur ♂ 8.5-9.0, ♀ 9.8-10.0 mm. —Tadzhikistan. (Figures 69, 71) *1. C. ninae (Mistsh.)

Mishchenko, 1937, Konowia, XVI 133, Figures 1, 3 (Gomphomastax) Bei Bienko, 1949a 734

4. Genus Brachymastax Rme.

Ramme, 1939, Mitt. Zool. Mus. Berlin, 24 127, Bei-Bienko, 1949a 734

Antennae in ♀ hardly longer than head and pronotum, 14-segmented, apically slightly expanded. Head very small, fastigium, when seen from above, is strongly concave anteriorly and seems bi-apical, frontal ridge about middle of eyes distinctly narrowed twice so as to reach the median ocellus, farther on ventrad gradually narrows. Pronotum very wide, with a distinct median carina and with lateral strongly curved, distinctly pro-
115 jecting folds, which makes the pronotum seem strongly rugose, lateral lobes with widely rounded postero-ventral margin, posterior margin slightly S-shapedly curved, metanotum strongly rugose. Hind femora relatively short. Ventral valves of ovipositor without large separated teeth on outer margin, in basal half stout, in apical half with arcuate notch, separating a well-marked narrow hook which is moderately bent.

One species from northern Afghanistan, known only from ♀.

The taxonomic position of this genus cannot be considered as completely established because it is known only according to one sex and is insufficiently described; in particular the structure of claws on the tarsi is unknown. If these claws are of identical size and longer than the empodium between them, the position of this genus will probably correspond to that accepted in the present work.

1 (1). Occiput rugose, with a longitudinal carina extending from fastigium to anterior margin of pronotum. Hind tibiae externally with 18 short spines, internally with 15 very long spines; length of spines of inner row in apical part of tibia exceeds its width. Length ♀ 16, hind femur 10 mm; ♂ unknown.—Afghanistan: Pagman Range, zone of Alpine meadows at height 2500-2800 m. 1. Br. afghana Rme.

Ramme, 1937, Mitt. Zool. Mus. Berlin, 24:128, Figure 51, Bei-Bienko, 1949a:734.

5. Genus Oreomastax B.-Bienko

Bei-Bienko, 1949a 734.

Antennae short, 12-14 segmented, slightly flattened, in ♂ not less than 1.5 times, in ♀ only somewhat longer than fore-femora; apical segments in ♀ not expanded. Fastigium strongly projects anteriorly between eyes, forming an acute angle with front, separated from latter by a strong, medially interrupted transverse carina; frontal ridge not projecting anteriorly between antennae, moderately expanded above level of lateral ocelli. Pronotum cylindrical, without regular lateral carina; posterior margin straight, or in ♀ with a weak notch in the middle; lateral lobes with an oblique irregular carinately convex line, extending from antero-ventral angle of lobe through dorsal end of transverse groove almost till posterior margin of pronotum. Thoracic plate with a slightly rounded anterior margin. Fore- and mid-femora with weak, almost effaced spines on end; hind femora long, slender, with numerous spinules on dorsal median carina and single spinules on remaining dorsal carinas, apically ending with weak spines. Tarsi with completely identical, symmetrical claws; empodium half the length of the claws (Figure 75). Subgenital plate in ♂ short. Ovipositor as in Gomphomastax Br.-W. but shorter.

This genus, according to its features, occupies an intermediate position between Phytomastax B.-Bienko and Clinomastax B.-Bienko; it is close to the first of these genera because of its external aspect, the structure of its pronotum, slightly flattened antennae and the structure of the ♀ ovipositor, with the second—because of the form of the head, which is short with a small number of segments in the antennas and the presence of an oblique carinate convex line on the lateral lobes of the pronotum.

116 At present only one species is known from northern Afghanistan.

1 (1). Brownish-yellow; ♂ with a dark stripe on sides. Hind tibiae in ♂ with 17 inner spines which are not uniform, and 22 outer spines. Subgenital plate in ♀ with a short rectangular lobe in the middle of the posterior margin and with weak angular notches on sides. Ventral valves of ovipositor with 2 well-separated teeth on outer margin and

with a tooth at base of outer margin. *Length* ♂ 13.5, ♀ 20.5 *mm*; hind femur ♂ 8 mm. —Northern Afghanistan: Irgailyk Pass. (Figure 75) . . . . 1. Or. morosa (Mistsh.)

Mishchenko, 1937, Journ. Bomb. Nat. Hist. Soc., XXXIX 809, Figure 6 (Gomphomastax) Bei-Bienko, 1949a 734, Figure 1m.

6. Genus Paedomastax C. Bol.

C. Bolivar in Uvarov, 1927a 200, C. Bolivar, 1930 Bei-Bienko, 1949a:733
Type of genus P. avinovi (Uv.).

As Gomphomastax Br.-W. but body more thickset, antennae 15-18-segmented, rather short (Figure 72), frontal ridge on the level of lateral
117 ocelli, somewhat narrowed, between antennae strongly expanded, farther ventrad strongly narrowed (Figure 70), legs shorter, all femora on the dorsal aspect without spinules on carinas and without distal spines; tarsi with claws identical in length; empodium between them shorter than claws (Figures 76, 77).

According to its morphological features, this genus represents a further development of those peculiarities which already partially began to show in genera Phytomastax B.-Bienko and Pachymastax B.-Bienko because of loss of such features of genus Gomphomastax Br.-W. as asymmetrical claws of tarsi, slender body and long, multisegmented antennas. Hence genus Paedomastax can be related to Gomphomastax only through genera Phytomastax and Pachymastax.

Three species are known, bordered in their distribution by western Himalayas, one undefined species, close to P. avinovi (Uv.), is indicated for southwestern Tibet situated on the border.

1(2). Antennae in ♂ longer, reaching metanotum, 18 segmented, apically dark, slightly expanded but not club-shaped. Pronotum dorsally strongly rugose, with white lateral lines, converging backwards, lateral lobes brillantly black, with whitish ventral margin. Length ♂ 10.5, hind femur 7.8 mm, ♀ unknown. —Himalayas northern Punjab. . . . . 1. P constricta (Br.-W.)

Brunner-Wattenwyl, 1898, Abhandl. Senckenb. Nat Ges., XXIV 223 (Gomphomastax) Uvarov, 1927a 200.

2(1). Antennae shorter, 15 segmented, in ♂ somewhat longer than head with pronotum, apically distinctly club-shapedly thickened and dark (Figure 72), in ♀ even shorter, slightly thickened on apex. Pronotum without white lateral lines.

3(4). Head anteriorly narrower, with slightly projecting eyes, height of head from ventral margin of frons to fastigium markedly exceeds its greatest width in ventral part. Eyes in ♂ not longer than subocular groove, in ♀ significantly shorter than it. Frontal ridge beneath median ocellus strongly narrowed. Coloration of body blackish, with lighter spots, head beneath eyes and behind them with a black spot; lateral lobes of pronotum with a light spot on anterior margin

and on postero-ventral angles. Length ♂ 11, ♀ 20 mm; hind femur ♂ 8.5, ♀ 10 mm. —Kashmir: Karakorum, height 4700-4800 m. . . . . 2. P. visseri Will.

Willemse, 1935 in. Visser, Wiss. Erg. Niederl. Exp. Karakorum, Zool., I 215, Figure 1.

4(3). Head anteriorly (Figure 70) wider; its height from ventral margin of frons to fastigium in ♂ equal, in ♀ somewhat less than greatest width in ventral part. Eyes more convex, in ♂ markedly longer than subocular groove, in ♀ hardly shorter than it. Frontal ridge beneath median ocellus moderately narrowed, in ♂ less than half, in ♀ half the width between antennae. Body grayish, head monochromatic. Pronotum, especially in ♀, rugose; lateral lobes with a wide, slightly sloping longitudinal black stripe and lighter postero-ventral part, and in ♀ also in anterior half of ventral margin, ♂ with
118 a sloped callous-shaped swelling in dorsal part of lateral lobes, crossed by a transverse groove. Subgenital plate in ♀ posteriorly with a short rounded lobe, carrying medially a small triangular process. Length ♂ 12, ♀ 21-24 mm; hind femur ♂ 8.0-8.5, ♀ 8.3-9.0 mm. —Kashmir: Karakorum, height 4500 m. (Figure 72). . 3. P. avinovi (Uv.)

Uvarov, 1914, Russkoe entomologicheskoe obozrenie, XIV 223 (Gomphomastax); Uvarov, 1927a:200.

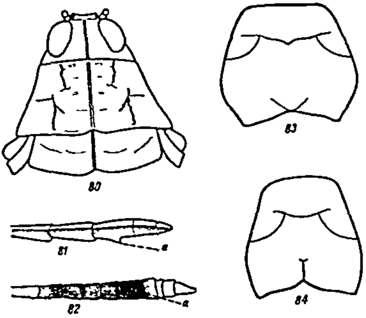
5(0). Insufficiently defined species, probably close to the preceding one but differing by 17-segmented antennae and monochromatic body devoid of light spots on lateral lobes of pronotum. —Southwestern Tibet . . . . 4. Paedomastax sp.

Uvarov, 1925, Miss. Babault. Prov. Centr. l'Inde et l'Himalaya, Ins. Orthopt., Acrididae:9 (Gomphomastax).

7. Genus Pachymastax B.-Bienko

Bei-Bienko, 1949a:733.

Body strongly swollen in thoracic area, distinctly narrowing anteriorly and caudad. Antennae 23 segmented, in ♀ not longer than fore-femora. Head with slightly projecting eyes; frontal ridge strongly narrowed and slightly restricted on level of lateral ocelli, between antennae somewhat expanded. Pronotum (Figure 80) very short and wide, strongly expanded caudad, in adult specimens with strong transverse rugae; median carina irregular; lateral lobes high, with widely separated laterally postero-ventral angles, their ventral margin strongly sloping. Median carina of meso- and metanotum with a thin longitudinal groove. Fore- and mid-femora without spines on end; hind femora stout, with spinules on dorsal and dorso-outer carinas and with one apical spine, situated on the end of dorsal carina. Claws on tarsi identical, empodium between them small, shorter than half of claw. Subgenital plate in ♀ posteriorly rounded, without a distinct acute-angular lobe in the middle.



Figures 80-84
(Original)

80—Pachymastax fusiformis B.-Bienko, ♀, head, pro-, and mesonotum, from above (type) 81—Clinomastax ninae (Mistsh.), ♂, apex of antenna, from the side (a—antennal organ), 82—Phytomastax opaca (Kr.), ♂, apical third of antenna (a—antennal organ), 83—Ph. robusta (B.-Bienko), ♀, meso- and metathorax, from below (paratype) 84—Ph. opaca (Kr), ♀, ibid (Prihevalsk).

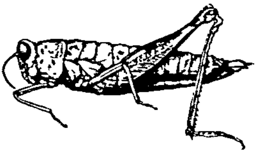


Figure 85. Phytomastax robusta (B.-Bienko), ♀ (Kungei Ala Tau near the lake Issyk Kul) (Original)

Most closely related to Phytomastax B.-Bienko, especially to the group of thickset species of this genus (Ph. robusta B.-Bienko and Ph. sijazovi Uv.).

Only one species from Kashmir is known.

1(1). Gray. Antennae in ♀ apically slightly expanded, all the segments short, not longer than their width. Thorax and abdomen dorsally with rare, very small scattered granules. Hind femora in ♀ 4.5 times longer than their greatest width. Hind tibiae with 17 outer and and 13 inner spines. Length ♀ 18.5, hind femur 12.5 mm; ♂ unknown. —Western Ladakh in Kashmir, 3300-4500 m. (Figure 80). . . . . 1. P. fusiformis B.-Bienko.

Bei-Bienko, 1949a:733.

8. Genus Phytomastax B.-Bienko

Bei-Bienko, 1949a:732.
Type of genus: Ph. opaca (Kr.).

Similar to Gomphomastax Br.-W., differing from it by the following features. Antennae in ♀ not longer or hardly longer than fore-femora
119 (Figure 73). Claws on tarsi of completely identical sizes; empodium between them short, almost half the length or half the length of the claws (Figures 76-77).

Six species of this genus are known, one of which—Ph. robusta (B.-Bienko)—is distributed farther north than the others (Trans-Ili and Kungei Ala Tau) and one which is somewhat separate (Ph. bolivari (Uv.)) is known from Kashmir.

There are three separate groups of species in the limits of the genus: group of Ph. opaca (Kr.) and Ph. hissarica (B.-Bienko) which is characterized by a very slender body, group of Ph. sijazovi (Uv.) and Ph. robusta (B.-Bienko) which is distinguished by a thickset body, and group of Ph. bolivari (Uv.), which sharply differs from the 2 preceding groups by peculiarities of structure of pronotum and armament of hind femora.

The known species of this genus (Ph. opaca, Ph. artemisiana and Ph. robusta) live on bushes (e.g., Caragana pygmaea) or semibushes (wormwood, etc.) in conditions of mountainous stony deserts or in associations of mountainous xerophytes.

1(6). Body very slender, slightly rugose or almost smooth. Hind femora long, narrow, in ♂ 6-7, in ♀ 5.2-6 times longer than their greatest width. Thoracic plate slightly elongated or of identical length and width (Figure 84).

120 2(3). Antennae short, in ♀ only equal in length to fore-femora, median segments not longer than their width (Figure 73); antennae in ♂ 1/4 shorter than hind femora, apically darkened except 2-3 terminal segments, median segments only 2-2.5 times longer than their width (Figure 82). Empodium between claws at least somewhat longer

than half the claws (Figure 76). Fore- and mid-femora apically at least with weak distal spines; hind femora with few spinules on dorso-inner carina and with distinct distal spines on genicular lobes. Frontal ridge, when seen from side, distinctly projects forward between antennae, in ♀ somewhat concave beneath them. Body often light-green. Length ♂ 10.5-12.5, ♀ 15-22 mm; hind femur ♂ 8.5-9.4, ♀ 10-12 mm. —Mountainous stony desert around Lake Issyk Kul, northern slopes of Terskei Ala Tau till the height of 2200 m, Ketmen Range, inhabits bushes of pea-tree, wormwood and other plants . . . . *1. Ph. opaca (Kr.)

Krauss in Zubovskii, 1898, Ezhegodnik Zoologicheskogo muzeya AN, III:110, (Parerucius) Jakobson, 1905 212 (Gomphomastax), Uvarov, 1927a 199 (Gomphomastax) Bei-Bienko, 1949a:732, Figures 1, o

3 (2). Antennae in ♀ hardly longer than fore-femora, median segments 1.5-2 times longer than their width, antennae in ♂ not shorter than hind femora, median segments 3.5-4 times longer than their width, apex only with one entirely light terminal segment (in ♂ Ph hissarica (B. -Bienko) antennae unknown but probably correspond to the given description). Empodium between claws not longer than half of claws (Figure 77).

4 (5). Vertex forms an obtuse angle with frons and is separated from the frons with a distinct medially interrupted transverse carina. All the femora have distal spines, hind femora with spinules at least on dorsal inner carina and on genicular lobes. Hind tibiae externally with 20-24, internally with 18-20 spines. Ventral margin of antennal sockets situated markedly above the level of ventral margin of eyes. In vivo stained in wormwood color. Length ♂ 13-14, ♀ 19-24 mm, hind femurs ♂ 9.3-10.1, ♀ 11.5-12.0 mm. —Kazakhstan eastern spurs of Trans-Ili Ala Tau (Syugota Mts.). Lives on bushes of Turchaninov's wormwood. (Figure 77). . . . . *2. Ph. artemisiana B. -Bienko.

Bei-Bienko, 1949a 733, Figure 1a.

5 (4). Vertex passes roundly into frons and is not separated from the latter by a transverse carina Fore- and mid-femora without distal spines, hind femora without spinules on all three dorsal carinae and on genicular lobes. Hind tibiae externally with 19-22, internally 16-18 spines. Ventral margin of antennal sockets in ♀ situated almost on the level of ventral margin of eyes. Length ♂ 13, ♀ 19.5 mm, hind femora ♂ 9.8, ♀ 11 mm. —Uzbekistan southern slopes of Hissar Range. . . . . *3. Ph hissarica (B. -Bienko).

Bei Bienko, 1947, Proc Ent. Soc Lond , (B), XVI 24, Figure 3 (Paedomastax) 1949a:733

6 (1). Body thickset, especially in ♀. Hind femora short, rather stout, in ♂ 4.5-5.0, in ♀ 4-5 times longer than its greatest width. Thoracic
121 plates somewhat transverse, e.g., its width exceeds its greatest

length (Figure 83). Antennae in ♂ apically black, without light terminal segment (♂ Ph. bolivari (Uv.) unknown).

7 (10). Pronotum with irregular carinate rugae but without distinct lateral carinas and without oblique carinate fold on lateral lobes. Hind femora without spinules on all 3 dorsal carinas. Hind tibiae with 18-22 spines on outer and with 14-16 spines on inner margin. Antennae in ♀ completely filiform.

8 (9). Vertex arcuately passes merges with frons. Spines of inner row of hind tibiae widely separated, moderately long and narrower, significantly shorter and narrower than long inner spur on apex of tibia. Antennae in ♂ hardly expanded apically, almost filiform. Subgenital plate in ♀ posteriorly with a short wide process, distinctly narrowed in the shape of a ledge in apical part and terminating here in a median acute-angular lobe. Dark gray or grayish-yellow, ♂ without black stripe on sides. Length ♂ 13-15, ♀ 19-25 mm; hind femur ♂ 9-10, ♀ 10.0-11.5 mm. —Kazakhstan: Trans-Ili Ala Tau east to Tur-Aigyr Range; Kirgizia; southern slopes of Kungei Ala Tau from 1800 m and higher. Pebbled slopes with wormwood, also found on other small bushes. (Figures 83, 85). *4. Ph. robusta (B.-Bienko).

Bei-Bienko, 1936, Ann. Mag. Nat. Hist., (10), XVIII:305 (Gomphomastax). 1949a:733.

9 (8). Vertex forms almost a right angle with frons. Spines on inner aspect of hind tibiae almost equal in length and width to long inner spur, very close; distance between these spines in apical half of tibia not more than width of base of spine. Antennae in ♂ distinctly expanded apically. Length ♂ 4, ♀ 20 mm; hind femur ♂ 10.5, ♀ 11.5 mm. —Uzbekistan: Zeravshan Range, 3000 m. *5. Ph. sijazovi (Uv.)

Uvarov, 1914, Russkoe entomologicheskoe obozrenie, XIV:223 (Gomphomastax), Bei-Bienko, 1949a: 733.

10 (7). Pronotum with distinct, in anterior third with parallel, in median part with diverging lateral carinas; lateral lobes with an oblique carinate fold. Hind femora with two spinules on dorsal and dorso-outer margin. Hind tibiae with 14 outer and 10 inner spines. Antennae in ♀ distinctly expanded apically. Vertex arcuately merges
122 with frons. Subgenital plate in ♀ with a short triangular median lobe and with 2 shorter, widely rounded lateral lobes. Length ♀ 14, hind femur 8 mm; ♂ unknown. —Kashmir, 3150 m. . . . . 6. Ph. bolivari (Uv.)

Uvarov, 1936, Opusc. Ent., 1-18, Figure 1 (Gomphomastax).

9. Genus Gomphomastax Br.-W.

Brunner-Wattenwyl, 1898, Abhandl. Senckenb. Nat. Ges., XXIV:232, Jakobson, 1905:211, C. Bolivar, 1930:291, Bei-Bienko, 1949a:731. —Pareuclus Kraus in: Zubovskii, 1898, Ezhegodnik Zoologicheskogo muzeya AN, III:108.

Type of genus: G. antennata Br.-W.

Antennae 19-25 segmented, in ♂ long, at least slightly club-shapedly expanded at apex (Figures 74-90), in ♀ often almost filiform and 1.5-2 times longer than fore-femora Vertex slightly convex, not projecting or slightly projecting anteriorly between eyes, roundly passes into frons and forms an indistinct obtuse angle. Frontal ridge above antennae wide, strongly narrowing from fastigium ventrad, beneath median ocellus with almost parallel margins (Figure 86). Pronotum short, without regular lateral carinas; transverse groove developed only on lateral lobes. Meso- and metanotum with a median carina. Legs thin, long, fore- and mid-femora dorsally with 2 longitudinal carinas ending with a short spinule; hind femora with small spinules or on 3 dorsal carinas or at least on one of them, apically with spines on ends of dorsal carinas and on genicular lobes. Tarsi with asymmetrical claws; hind claw longer than front (outer) claw; empodium between claws large, asymmetrical, significantly longer than half of lesser claw (Figures 78-79) Subgenital plate in ♀ apically with 1 or 3 cusps (Figures 88-89). Dorsal valves of ovipositor with numerous denticles on dorso-outer margin (Figure 87).

Eleven species are known, distributed from Dzungarian Ala Tau in the north to the mountains of Tadzhikistan in the southwest and Kashmir in the southeast. In the limits of the whole range of the given genus, a possibility exists of finding species which are still unknown, especially in the high southeastern mountainous regions of Middle Asia. All species which are known at present are included in the key.

1 (4). Subgenital plate in ♀ with 3 cusps on the end (Figure 88) Vertex forms a distinct angle with front and somewhat projects anteriorly between eyes. Antennae apically black, without light end.

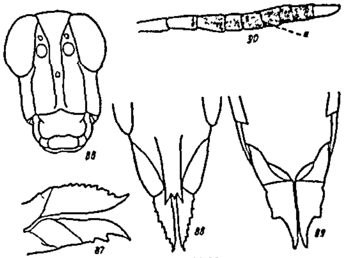
2 (3). Hind tibiae with 14-19 spines on outer end and with 10-13 spines on inner margin. Vertex separated from front by a weak, incomplete transverse carina. Subgenital plate in ♀ posteriorly with a very long narrow process, lateral cusps on the end of process longer than median one (Figure 88). Hind femora in ♂ shorter and stouter than in ♀. Length ♂ 9, ♀ 11 mm, hind femora ♂ 5.7, ♀ 9 mm. —Kashmir, 3300-3900 m . . . . 1. G. disparilis C. Bol.

C Bolivar in Uvarov, 1927a 198, C. Bolivar, 1930 300

3 (2). Hind tibiae with more numerous spines on margins. Vertex not separated from frons by transverse carina. Median cusp on posterior margin of subgenital plate in ♀ longer than lateral cusps Hind fe-
123 mora in both sexes long and thin. Length ♂ 9-15, ♀ 13-21 mm, hind femur ♂ 8-12, ♀ 9-13 mm —Kashmir, 1500-3000 m . . . . 2 B. antennata Br.-W

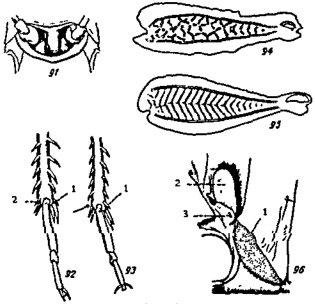
Brunner Wattenwyl, 1898, Abhandl. Senckenb Nat. Ges , XXIV 232, tab 18, Figure 34, Jakobson, 1905 212 Uvarov, 1927a 199.

4 (1). Subgenital plate in ♀ ends with 1 median cusp and often with 2 blunt processes on each side (Figure 89). Vertex passes into frons arcuately and if angular does not project anteriorly between eyes.



Figures 86-90
(Original)

86—Gomphomastax clavata (Ostr.), ♂, head, front view, 87—G. clavata plotnikovi C. Bol., ♀, ovipositor, from the side; 88—G. disparilis C. Bol., ♀, tip of abdomen and ovipositor from below (Tragbal, Kashmir), 89—G. clavata (Ostr.), ♀, ibid. (Alma-Ata), 90—Gomphomastax gussakovskii Mistsh., ♂, apical part of antenna (a — antennal organ).



Figures 91-96
(Original)

91—prosternum of Calliptamus italicus (L.), 92—end of hind tibias and tarsus of Dericorys (1—inner apical spine, 2—outer apical spine), 93—end of hind tibia and tarsus of Calliptamus (1—inner apical spine, place of the absent outer spine shown by an arrow), 94—hind femur of Asiotmethis, 95—hind femur of Calliptamus; 96—lateral aspect of first and second abdominal segments of Pezotmethis tartarus (Saus.) (1—rough plate, 2—tympanic organ, 3—tympanic lobe)

5(14). Empodium between claws large, longer than lesser claw and often equal in length to greater claw, claws distinctly asymmetrical (Figure 78). Vertex roundly passes into frons and is not separated from it by transverse carina, or only a weak carina is present.

6(13). Antennae with a light terminal segment or in ♀ sometimes entirely undarkened apically. Mesosternum without transverse convex fold on posterior margin or this fold is developed only in median part and does not reach lateral margins of mesosternum. Hind femora with spinules on 3 dorsal carinas, in ♂ 6.5-7.0, in ♀ 5.6-6.4 times longer than their width.

7 (8). Antennae in ♂ apically with 3 light terminal segments. Frontal ridge with a distinct constriction on the level of lateral ocelli, farther on ventrally wide and, at least in ♀, expanded between bases of anten-
124 nae. Body in vivo metallic green. Antennae in ♀ half, in ♂ 1/4 length of the hind femora, median segments in ♀ 1.5-2.0, in ♂ 2.5-3.5 times longer than their width. Spines of inner row of hind tibiae not longer than lateral width of tibia itself. Length ♂ 13-14, ♀ 18-22 mm, hind femur ♂ 10.2-11.0, ♀ 11.0-12.3 mm. —Dzungarian Ala Tau, meadows overgrown with different grasses, at height of 1200-1800 m, lives on upper layers of herbage and partially on bushes. . . . . *3. G. songorica B.-Bienko.

Bei-Bienko, 1948, Vestnik AN Kazakhskoi SSR, 8(41) 42, Figure 4

8 (7). Antennae in ♂ apically with 1 light terminal segment (Figure 90) (♂ of G. pamirica unknown but probably also belongs to this position in the key). Frontal ridge with indistinct constriction on the level of lateral ocelli, usually gradually narrowing from fastigium to clypeus (Figure 86).

9(12). Empodium between claws significantly longer than lesser claw and almost or completely equal in length to greater claw (Figure 78). Lateral lobes of pronotum in ♂ without a distinctly distinguishing wide whitish border on ventral margin.

10(11). Hind tibiae with 14-24 outer and 14-19 inner spines, 2 distal spines of inner margin not brought together or if they are brought together then not overlapping each other, outer ventral carina of hind tibiae with a small distal spinule on apex. Body in vivo metallic green. Widely distributed in Tien Shan in the north up to Trans-Ili Ala Tau, divided into a number of subspecies distinguished with difficulty. . . . . *4 G clavata (Ostr)

a (d). Antennae longer, with a hardly discernible club (vanishing in ♀), median segments in ♀ 2.5-4.0 times longer than their width

b (c) Pronotum with a blunt, slightly elevated median carina. Subgenital plate in ♀ projects posteriorly in the shape of a strong acute-angular lobe (Figure 89). Median antennal segments 2-4 times longer than their width. Length ♂ 12-14, ♀ 20-24 mm, hind femora ♂ 11 0-12.5, ♀ 12.5-14.0 mm. —Kazakhstan foothills of Trans-Ili Ala Tau, at heights of 1000-1200 m, meadows overgrown with different grasses and brushwoods of roses, lives on plants, sometimes injurious to strawberry plantations. Indication for Kashmir (Salfi, 1934)

undoubtedly refers to another species . . . . *4a. G. clavata clavata (Ostr.)

Ostroumov, 1881, Zool. Anz., IV:597 (Chrysochraon). Jakobson, 1905:212. Uvarov, 1927a·199, Figure 261; Bei-Bienko, 1949a:731, Figure 1c. —antennatus Krauss in: Zubovskii, 1898, Ezhegodnik Zoologicheskogo muzeya AN, III.109 (Parerucius) (not Brunner-Wattenwyl, 1898).

c (b). Pronotum with a distinct sharp median carina. Subgenital plate in ♀ posteriorly with a wide separated lobe, carrying in the middle of the posterior margin a small acute-angular process or almost a spine-shaped appendix. Median antennal segments in ♀ 2.5-3.5 times longer than their width. Length ♂ 11-13, ♀ 19-23 mm; hind femurs ♂ 9.5-11.0, ♀ 11.5-13.5 mm. —Southern Kazakhstan: Tashkent Ala Tau; southern foothills of Chatkal and Ferghana Ranges in the limits of southern Kirghizia and Uzbekistan. (Figure 87). . . . . *4b. G. clavata plotnikovi C. Bol.

C. Bolivar in· Uvarov, 1927a.199, C. Bolivar, 1930.298.

125 d (a). Antennae shorter, usually markedly clavate at apex; median segments in ♀ only 1.5-2 times longer than their width. Subgenital plate in ♀ and median carina of pronotum as in G. clavata clavata (Ostr.). Length ♂ 11-13, ♀ 18-22 mm; hind femurs ♂ 9-11, ♀ 10.0-12.5 mm. —Trans-Ili Ala Tau, at height of up to 2000-2500 m (type ♀, valley of Malaya Almatinka River) and probably higher, Kungei Ala Tau, Chatkal Range up to 3300 m. Is found on high mountainous meadows overgrown with different grasses; connected with preceding subspecies by gradual transitions . . . . *4c. G. clavata alticola B.-Bienko subsp. n.

11 (10). Hind tibiae with 25-27 outer and 20 inner spines; 2 distal spines of inner margin closely brought together, almost overlapping each other; outer ventral carina without distal spinule. Body in ♀ with a dark stripe on sides, median antennal segments 2.5-3 times longer than their width; genital plate with sinuous lateral aspects of posterior margin and narrow median acute-angular process. Length ♀ 20, hind femur 12 mm; ♂ unknown. —Pamir: Chil Dara . . . . *5. G. pamirica B.-Bienko.

Bei-Bienko, 1949a·732.

12 (9). Empodium between claws hardly longer than lesser claw and distinctly shorter than greater claw. Lateral lobes of pronotum, at least in ♂, with a wide, light, distinctly distinguishing border on ventral margin. Olive green, on sides with a distinct black longitudinal stripe, often developed also in ♀, frons bordering on the vertex often with a black transverse stripe. Antennae in ♂ apically slightly expanded (Figure 90), equal in length to hind femora, the median segments 4-5 times longer than their width; antennae in ♀ hardly longer than half of hind femora, median segments 2.5-3.5 times longer than their width. Length ♂ 10.5-15.0, ♀ 18.0-23.5 mm; hind

femora ♂ 10.5-11.5, ♀ 11.5-13.0 mm. —Southern slopes of Hissar Range in Tadzhikistan, up to height of 3000 m. Injurious to bogar † crops of alfalfa, fruit trees, wild and cultivated almonds, consuming the leaves . . . . *6. G. gussakovskii Mistsh

Mishchenko, 1949b 169, 1950, Doklady AN SSSR, (novaya seriya), LXXI, 4:792, Figures 1[7-8].

13 (6). Antennae on the end black, without a light terminal segment (Figure 74). Mesosternum on posterior margin with a transverse convex pad, reaching its lateral aspects. Hind femora without spinules or with single spinules on dorsal and outer carinas, rather thickset, in ♂ 6 times, in ♀ 5.3 times longer than their greatest width. Body grayish, in vivo slightly light olive, ventral margin of lateral lobes of pronotum with a wide whitish border. Hind tibiae on apex ventrally without a spinule on the end of outer carina. Length ♂ 12.0-13.5, ♀ 18.0-22.5 mm, hind femur ♂ 9.5-10.0, ♀ 11.5-12.0 mm. — Northern part of Dzungarian Ala Tau, from 1800 m and higher; lives mainly on juniper. . . . . *7. G. juniperi B.-Bienko.

Bei-Bienko, 1948, Vestnik AN Kazakhskoi SSR, 8(41) 43, Figure 5

14 (5). Empodium between claws shorter than both claws, more rarely almost equal to lesser claw (Figure 79), then vertex forms on obtuse angle with frons and separated from it by a distinctly marked medially interrupted transverse carina. Claws of tarsi slightly asymmetrical, e.g., posterior claw only slightly longer than the opposite one,
126 especially in ♀ (Figure 79).

15 (20). Antennae with a light terminal segment, at least in ♂ distinctly expanded apically. Frontal ridge in ♂ strongly, in ♀ slightly projects anteriorly between bases of antennae Body, at least in ♂, with a black stripe on sides. Hind femora with spinules on 3 dorsal carinas.

16 (19). Thoracic plate slightly rounded anteriorly, its antero-lateral angles in ♀ slightly marked, in ♂ almost not marked. Hind tibiae internally with 15-19 spines, in ♀ preapical spines (except 3-4 apical spines which are more brought together) widely separated.

17 (18) Larger. Vertex passes into front arcuately and is not separated from latter by distinct transverse carina. Antennae in ♀ thinner, twice shorter than hind femora, their median segments 2.5-3.5 times longer than their width; antennae in ♂ equal to hind femora, length of median antennal segments 4-5 times greater than their width. Hind femora more thickset, in ♀ 5.1-5.3, in ♂ 5.6-6.5 times longer than their width. Length ♂ 12.5-14.0, ♀ 20-23 mm, hind femur ♂ 10-11, ♀ 12.5-13.0 mm. —Eastern part of Kirghizian Ala Tau (Figure 79). . . . . *8. G. shnitnikovi B.-Bienko.

Bei-Bienko, 1949a:732, Figure 1:

18 (17). Smaller. Vertex forms an obtuse angle with frons and is separated from it by a distinct medially interrupted transverse carina.

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† [Not requiring irrigation in irrigation areas]

Antennae in ♀ stouter, 2.25 times shorter than hind femurs, median segments only 1.5-2 times longer than their width; antennae in ♂ as in preceding species. Hind femora more slender, in ♀ 5.7, in ♂ 6.6-6.8 times longer than their width. Length ♂ 11-12, ♀ 18.0-20.6 mm; hind femur ♂ 9.5-9.8, ♀ 11.5 mm. —Ferghana Range, up to 2900 m. . . . . *9. G. dunaevae Mistsh.

Mishchenko, 1937, Ann. Mag. Nat. Hist., (10), XX:92, Figures 1-4.

19(16). Thoracic plate with a straight anterior margin and slightly rounded antero-lateral angles. Hind tibiae internally with 19-23 spinules, in ♀ 8-9 apical spines brought together, spaces between them not wider than spines themselves. Antennae in ♂ as in preceding species; in ♀ half the length of the hind femora, median segments 1.5-2 times longer than their width. Lateral lobes of pronotum with an irregular oblique carinate fold; in ♂ this fold is situated on a light oblique stripe. Dorsal valves of ovipositor on outer margin with 5-9 denticles. Length ♂ 13-14, ♀ 20.0-22.5 mm; hind femur ♂ 10.5-11.7, ♀ 12.0-13.3. —Uzbekistan: southern slopes of Hissar Range north of Sary-Assia . . . . *10. G. gigantea Mistsh.

Mishchenko, 1937, cited publications:94.

20(15). Antennae in ♂ apically black, without light terminal segment, almost completely filiform, somewhat shorter than hind femora. Frontal *ridge in ♂ slightly projects anteriorly between antennae. Body in* ♂ without black stripe on sides. Vertex forms almost a right angle with front. Eyes in ♂ almost twice longer than subocular groove. Hind femora in ♂ very slender, 7 times longer than their greatest width, spinules slightly marked only on dorsal inner carina. Length
127 ♂ 12, hind femur 11 mm; ♀ unknown. —Kughitang Range in southern Uzbekistan, height 2800 m . . . *11. G. kughitangi B.-Bienko.

Bei-Bienko, 1949a:732.

4. Subfamily EUMASTACINAE

Antennae short, not longer than fore-femora. Frontal ridge well-marked throughout, narrow, with a deep groove; median ocellus situated on or above level of ventral margin of eyes. Pronotum simple, more or less cylindrical. Tegmina and wings completely developed or abbreviated, or body completely apterous. Legs thin, long; fore tibiae ventrally in apical part with two rows of spines; first segment of hind tarsi without spinules on both dorsal margins.

A small number of genera peculiar mainly to South and Central America; two genera are known from mountains of southeastern states of U. S. A. and several genera are distributed in southeastern Asia, only one of which—China Burr—reaches Central China in the north.

10. Genus China Burr

Burr, 1899, Ann. Soc. Espan. Hist. Nat., XXVIII 256, Burr, 1903, Gen. Insect, fasc. 15, Orth. Eumast. 14, C. Bolivar, 1930 377.

Antennae 11 segmented, filiform. Frontal ridge with a strong constriction at the level of lateral ocelli, almost with contiguous margins, farther on expanded ventrally, beneath median ocellus slightly narrowed again. Pronotum saddle-shaped, with well-marked median carina, intersected by transverse groove in front of the very middle. Tegmina and wings completely developed, extending beyond distal end of hind femora; apex of tegmina obliquely truncate. Spines of inner row of hind tibiae homogenous, gradually decreasing to the base of tibia, without sharply distinctive long spines, first segment of hind tarsi with hair, outer carina in ♀ with terminal tooth. Cerci in ♂ simple, small, conical. Subgenital plate in ♂ specialized, in ♀ triangularly projecting apically.

Only one species is known.

1 (1). Tegmina and wings transparent, colorless or in ♀ tegmina along costal field with a narrow dark stripe, and wings darkened on anterior margin. Hind femora with dark transverse bands, hind tibiae with 22 outer and 19 longer inner spines, mid-tibiae in ♂ in apical half with a wide lamellar lobe externally. Anal plate in ♂ with a round notch posteriorly. Subgenital plate in ♂ deeply divided into 2 flattened lobes. Length ♂ 18, ♀ 22.7 mm, tegmen ♂ 19, ♀ 17.8, hind femur ♂ 11, ♀ 11.8 mm —Southern and Central China, north up to Kiangsu Province, Thailand (Siam) On trunks of pines . . . . 1. Ch. mantispoides (Walk.)

Walker, 1870, Cat. Derm. Salt. Brit. Mus, 4 792 (Mastax) Burr, 1899 Ann. Soc Espan Hist. Nat., XXVIII 256, 304 Burr, 1903, Gen Insect, fasc 15, Orth Eumast. 14, C. Bolivar, 1930 377, Chang, 1937, Not. Ent. Chinoise, IV, 3 37.

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III. Family ACRIDIDAE —True Locusts and Grasshoppers

Head often with foveolae of different form, frontal ridge beneath ocellus not in shape of unpaired carina, often with a groove. Antennae longer than fore-femora, 8-28 segmented, filiform, ensiform, club-shaped or leaf-shaped, apically without specialization in shape of antennal organ, bases of antennae usually closer together than lateral ocelli. Pronotum short, not covering abdomen dorsally, often with lateral carinas. Tegmina, if developed, not narrowed medially, apically not obliquely truncate, if abbreviated then always longer than wings in this case. Fore-femora dorsally pad-shaped, without longitudinal carinas, hind femora ventrally in basal part inside from ventral median carina with a papilla-shaped tubercle (Brunner's organ) which is absent only in those few forms with very narrow hind femurs. All tarsi 3 segmented, first segment of hind tarsus dorsally without denticles, pulvilli on its ventral aspect not pointed, usually roundly convex, empodium between claws present but sometimes very small and barely discernible. Abdomen with tympanic organ on sides of first segment (Figure 96), more rarely this organ in some completely apterous forms is absent. Ovipositor in ♀ often with valves bent at the apical end either in the shape of a hook or otherwise

To this family belong all common locusts and grasshoppers peculiar to our fields, meadows, steppes and deserts, and attracting attention by their chirping on summer days. In comparison with the locusts and grasshoppers considered above, this family has the widest distribution, and is peculiar to all parts of the globe from the Arctic zone of Eurasia and North America to the southern extremities of Africa, South America and Australia. To this family belong the greatest number of representatives including over 10,000 species, of which there are almost 800 belonging to 200 genera in the U.S.S.R. and adjacent countries.

The family is divided into 8-9 subfamilies, six of which are present in the fauna of the U.S.S.R. Almost all of these subfamilies includes a great number of genera; therefore, to make diagnosis easier, a key to subfamilies is given at the beginning, and afterwards, for each subfamily, a key to genera.

Key to Subfamilies of Family Acrididae

1 (6). Prosternum between forelegs with a strong elongated process (Figure 91) or with lamellately elevated anterior margin, sometimes covering the mouth ventrally in shape of collar. More rarely these features are not marked, but then either: 1) hind tibiae on outer dorsal margin have an apical spine (Figure 92), or 2) hind femora externally between longitudinal carinae have only tubercles and small ridges but no regular feather-shaped areas (Figure 94).

2 (3). Hind femora externally between longitudinal carinae with regular feather-shaped areas (Figure 95). Vertex anteriorly without thin longitudinal groove. Antennae sometimes more than 19-segmented. Process on prosternum often cylindrical or conical (Figure 91) . . . . 1. Subfamily Catantopinae.

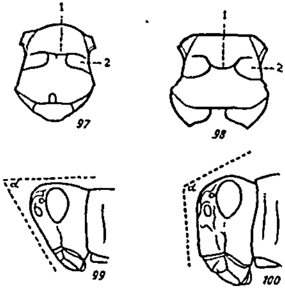
3 (2). Hind femora outwardly between longitudinal carinae only with tubercles and small ridges, but without regular feather-shaped areas
129 (Figure 94). Vertex anteriorly often with a thin longitudinal groove merging with front. Antennae not more than 19 segmented.

4 (5). Vertex completely horizontal, projecting anteriorly between eyes (Figures 564, 568-570) and forming an acute angle with the strongly sloping frons (Figures 563, 565); sometimes vertex is inclined and forms an obtuse, widely-rounded angle with frons, but then the foveolae are very closely brought together, divided only by a thin groove (Figure 571). Sides of second abdominal segment without rough plate . . . . 2. Subfamily Pyrgomorphinae.

5 (4). Vertex inclined anteriorly and ventrally, usually forming with frons a right or even obtuse, widely-rounded angle (Figures 577-580, etc.). Foveolae (if developed) always separated. Sides of second abdominal segment in alate forms with rough plate (Figure 96), or body completely apterous . . . . 3. Subfamily Pamphaginae.

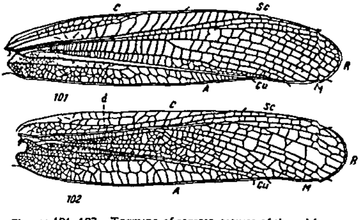
130 6 (1). Prosternum between forelegs plain, rarely with a small tubercle or spherically convex. Hind tibiae on outer dorsal margin without apical spine (Figure 93). Hind femora externally with regular feather-shaped areas (Figure 95), or completely smooth.

7 (8). Transverse groove of mesosternum medially strongly concave caudad (Figure 98). Sides of abdomen in ♂ often with vertical rugae



Figures 97-100
(Original)

97—sternum of Chorthippus (1—transverse groove of mesosternum 2—lateral lobes of mesosternum), 98—sternum of Egnatioides desertus Uv. (1 and 2—same as above), 99—head of Chorthippus brunneus (Thunb.) in profile (α —acute angle formed by vertex and front, 100—head of Oedipoda coerulescens (L.) in profile (α —obtuse angle formed by vertex and front)



Figures 101-102. Tegmina of representatives of the subfamilies *Acridinae and Oedipodinae. (Original)*

101—Dociostaurus maroccanus (Thunb.), ♂, (subfamily Acridinae), 102—Sphingonotus coerulans (L.), ♂ (subfamily Oedipodinae) (d—median false vein, lettering of other veins conventional).

(Figures 801, 802). . . . . 4. Subfamily Egnatiinae.

8 (7). Transverse groove of mesosternum medially straight or hardly concave caudad (Figure 97). Sides of abdomen in ♂ smooth.

9 (10). Antennae ensiform, club-shaped or leaf-shaped. If antennae are filiform then either: 1) foveolae regularly quadrangular, 2) empodium between claws large, not shorter or only in ♀ somewhat shorter than claws or, 3) the median field of tegmina is without spurious vein (Figure 101). Frons often strongly sloping and forms an acute angle with vertex (Figure 99) . . . 5. Subfamily Acridinae.

10 (9). Antennae always filiform. Foveolae not regularly quadrangular (sometimes they are only trapezoidal). Empodium between claws of tarsi small, even in ♂ not longer than half length of claws. Tegmina
131 with a spurious median vein in median field (Figure 102), or front forms a right, widely-rounded angle with vertex (Figure 100). Wings sometimes with a dark band. . . . . 6. Subfamily Oedipodinae.

1. Subfamily CATANTOPINAE

(= Acrididae, Cyrtacanthacrinae)

(Compiled by L.L. Mishchenko)

Frons sloping or vertical. Foveolae usually indistinct, lateral, sometimes completely absent. Pronotum with median carina sometimes pectinately elevated. Prothorax between the coxae of forelegs usually with a distinct median process; sometimes no median process or a weakly-developed one, in the shape of a low tubercle; anterior margin usually low, sometimes elevated in the shape of a collar or with a distinct median process. Hind femora between inner longitudinal carinas of outer aspect with regular convex areas in feather-shaped arrangement, the grooves between them depressed. Ovipositor in ♀ usually with dorsal valves similar to ventral valves and narrowed towards the tip; sometimes they are distinctly expanded apically and significantly greater than ventral valves. Epiphallus in ♂ arcuate or monolithic, without distinct lateral additional lobes, but usually with two or four motionless spines on posterior margin and with a smooth surface near them.

Subfamily Catantopinae widely distributed almost on the entire globe but especially richly represented in southern tropical countries, i.e., in Ethiopian, Indo-Malayan, Australian and Neotropical regions. Many representatives of this subfamily are considered as serious pests of cultivated plants, these are species of genera Oxya Stål, Conophyma Zub., Podisma Berth., Melanoplus Stål, Schistocerca Stål, Calliptamus Serv., etc.

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Key to Genera of Subfamily Catantopinae

1 (46). Hind tibiae with outer and inner dorsal apical spines (Figure 103). Sometimes outer dorsal apical spine absent, then either prothoracic process wedge-shaped, strongly flattened in width (Figure 104) and

wings well-developed or the body is completely apterous and width of vertex between eyes is 2.75 times more than the width of the frontal ridge between the antennae (Figure 105) and there is no tympanic organ on the first abdominal tergite.

2 (3). Hind tibiae in both sexes with 16-22 spines on outer margin. Head in both sexes short, its length significantly less than length of pronotum. Subgenital plate in ♂ short, significantly less than length of pronotum . . . . 1. Uvarovium Dirsh.

3 (2). Hind tibiae in both sexes usually with 6-14 spines on outer dorsal margin. Sometimes with 18-21 spines, then head large and its length almost equals length of pronotum, and subgenital plate in ♂ long, almost equal to length of pronotum.

4 (7). Foveolae in both sexes distinct, always situated on fastigium (Figure 106). Tegmina and wings in both sexes well developed, tegmina always extending beyond distal end of hind femora. Dorsal valves of ovipositor in ♀ with a distinct deep incision on dorso-external margin (Figure 107).

5 (6). Pronotum in both sexes in anterior part smooth, anterior transverse groove absent, median transverse groove barely discernible. Prothorax in both sexes with a distinct median conical process on anterior margin (Figure 108) . . . . 2. Dericorys Serv.

6 (5). Pronotum in ♀ (♂ unknown) in anterior part with distinct rugae and dots; both anterior transverse grooves distinct. Prothorax in ♀ without median process on anterior rounded margin (Figure 109) . . . . 3. Farsinella B.-Bienko.

7 (4). Usually no feveolae in both sexes, if they are developed then either they are situated far from fastigium (Figure 110) or the tegmina and wings are strongly abbreviated, lateral, and sometimes completely absent. Dorsal valves of ovipositor in ♀ without a notch on dorso-external margin (Figures 111-112)

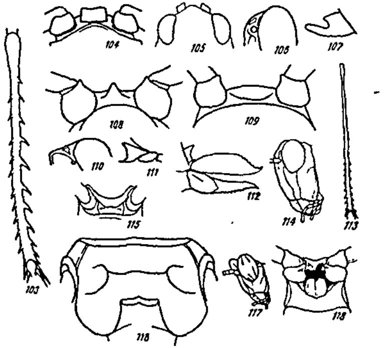
8 (11). Hind tibiae in both sexes in apical part with long strongly outward-projecting spines on dorsal outer margin (Figure 113). Dorsal valves of ovipositor in ♀ apically expanded, significantly longer than ventral valves (Figure 111).

9 (10). Body flattened. Frons in profile very slightly sloping (Figure 114). Prothorax smooth, with lamella-like, elevated anterior margin (Figure 115). Metastrenum wide; its greatest width significantly more than length of meso- and metasternum together (Figure 116) . . . . 4. Bufonacridella Ad.

10 (9) Body slender Frons in profile strongly sloping (Figure 117). Prothorax between coxas of forelegs with a short cone-shaped process (Figure 118). Metasternum narrow, its greatest width 1.5-2 times less than length of meso- and metasternum together (Figure 119). . . . . 5. Diexis Zub.

11 (8) Hind tibiae in both sexes in apical part with short spines on outer dorsal margin which slightly project outward (Figure 120) Dorsal
133 valves of ovipositor in ♀ narrowed apically, almost equal or insignificantly shorter than its ventral valves (Figure 112).

12 (29). Tegmina and wings usually well-developed, extending beyond tip of abdomen, sometimes abbreviated, then ventral genicular lobe of hind femur is produced into a sharp spine (Figure 127)



Figures 103-118
(Original)

103—Dericorys tibialis (Pall.), ♂, dorsal aspect of left hind tibia; 104—Iranella turcmena B.-Bienko, ♂, prothoracic process, from behind, 105—Plotnikovia lanigera Um., ♂, vertex, from above; 106—Dericorys tibialis (Pall.), ♂, upper part of head, from the side, 107—D. tibialis (Pall.), ♀, right dorsal valve of ovipositor, from the side; 108—D. tibialis (Pall.), ♀, prothoracic process, from behind, 109—Fassinella predtetshenskii B.-Bienko, ♀, anterior margin of prothorax, from behind, 110—Tropidopola cylindrica iranica Uv., ♂, dorsal part of head, from the side, 111—Diexis bellus Mistsh., ♀, ovipositor, from the side, 112—Oxya fuscovittata (Marsch.), ♀, ovipositor, from the side, 113—Diexis varentzovi varentzovi Zub., ♂, dorsal aspect of left hind tibia, 114—Bufonacridella sumakovi Ad., ♂, head, from the side, 115—B. sumakovi Ad., ♂, prothorax, from below, 116—B. sumakovi Ad., ♀, meso- and metathorax, from below, 117—Diexis varentzovi varentzovi Zub., ♂, head, from the side; 118—D. varentzovi varentzovi Zub., ♂, prothorax from below.

13(26). Head short, its length (dorsally) significantly less than length of pronotum. Mesosternal lobes distinctly separated, never conti-
134 guous (Figure 121), although sometimes the space between them is very narrow, then hind femur has the ventral genicular lobe produced in the shape of spine (Figure 127).

14(21). Hind femora usually with rounded ventral genicular lobe, always without apical spine (Figure 122), lobe rarely acute-angular (Figure 123), then pronotum with short black transverse grooves.

15(16). Body flattened, thickset. Tegmina wide, almost parallel-sided, sometimes even apically expanded. Wings quadrant-shaped. Mesosternum with wide inter-lobal space, its narrowest part 2.25-3 times greater than its length. Metasternum wide, its greatest width distinctly greater than length of meso- and metasternum together (Figure 121) . . . . 6. Iranella Uv.

16(15). Body slender. *Tegmina narrow, apically distinctly narrowed.* *Wings* elongatedly triangular. Mesothorax with a narrow interlobal space; its narrowest part 1/8-1/2 its length. Metathorax narrow, its greatest width almost 2/3 the length of the meso- and metathorax together (Figure 124).

17(18). Antennae short, not reaching posterior margin of pronotum. Pronotum with distinct lateral carinae, its transverse grooves colorless . . . . 7. Spathosternum Kr.

18(17). Antennae longer, reaching or extending beyond posterior margin of pronotum. Pronotum without lateral carinas, its transverse grooves stained black.

19(20). Pronotum dorsally with 4 transverse grooves. Prothoracic process wide, wedge-shaped, flattened in width, with a distinct triangular notch on apex (Figure 125) . . . . 8. Miramia Uv.

20(19) Pronotum dorsally with 3 transverse grooves. Prothoracic process conical, pointed (Figure 126) . . . . . . 9. Hieroglyphus Kr.

21(14) Hind femur with a ventral genicular lobe produced into a sharp spine (Figure 127). Pronotum always with colorless transverse grooves.

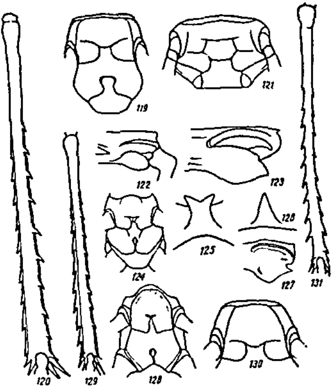
22(25). Tegmina well-developed, if abbreviated then on dorsum always overlapping each other. Hind tibiae in apical part flatly expanded, with distinctly marked margins of dorsal aspect (Figure 120).

23(24). Hind tibiae with 9-11 spines on inner dorsal margin, spines situated uniformly, spaces between them almost equal to each other (Figure 120). Mesosternum with a narrow inter-lobal space, its narrowest part 1/4-2/5 the narrowest part of the mesosternal lobe (Figure 128) . . . . 10. Oxya Serv.

24(23) Hind tibiae with 8-9 spines on inner dorsal margin, spines not uniformly situated penultimate spine placed far from apical spine, space between them significantly greater than any space between other spines (Figure 129). *Mesosternum with a wide inter-lobal* space, its narrowest part equals or is slightly less than narrowest part of mesosternal lobe (Figure 130) . . . . 11. Gesonula Uv.

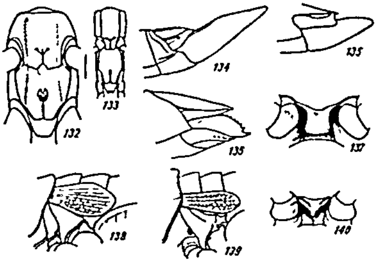
25(22). Hind tibiae in apical part not flattened and almost not expanded, margins of dorsal aspect rounded (Figure 131) .12. Caryanda Stål.

135 26(13). Head large, its length (dorsally) insignificantly less than or equal to the length of the pronotum Mesosternal lobes usually contiguous



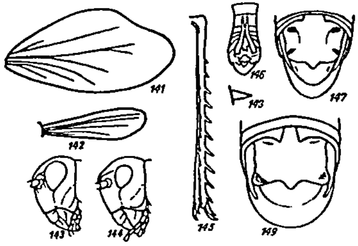
Figures 119-131
(Original)

119—Diexis gussakovskii Mir., ♀, meso- and metathorax, from below, 120—Oxya fuscovittata (Marsch.), ♀, dorsal aspect of left hind tibia, 121—Iranella turcmena B.-Bienko, ♂, meso- and metathorax, from below, 122—I. turcmena B.-Bienko, ♂, distal end of left hind femur, from the side, 123—Hieroglyphus annulicornis (Shir.), ♀, distal end of left hind femur, from the side, 124—Spathosternum prasiniferum prasiniferum (Walk.), ♂, meso- and metathorax, from below, 125—Miramia perpolita Uv., ♂, prothoracic process, from behind, 126—Hieroglyphus annulicornis (Shir.), ♀, ibid., 127—Oxya fuscovittata (Marsch.), ♂, distal end of left hind femur, from the side, 128—O. fuscovittata (Marsch.), ♂, meso- and metathorax, from below, 129—Gesonula punctifrons (Stål), ♀, dorsal aspect of left hind tibia, 130—G. punctifrons (Stål), ♀, mesothorax, 131—Caryanda spuria (Stål), ♀, dorsal aspect of left hind tibia.



Figures 132-140
(Figures 133 and 134 according to Tsai with alterations, the rest original)

132—Tropidopola turanica turanica Uv., ♂, meso- and metathorax, 133—Leptacris liyang (Tsai), ♂, Ibid., 134 L. liyang (Tsai), ♂, tip of abdomen from the side, 135—Tropidopola turanica turanica Uv., ♂, ibid., 136—T. turanica turanica Uv., ♀, ovipositor from the side, 137—Pezotettix giornae (Ross.), ♂, prothorax, front view, 138—P. giornae (Ross.), ♂, left tegmen, 139—Sphenophyma rugolosa (Stål), ♂, ibid., 140—Conophyma semenovi semenovi Zub., ♂, prothorax, front view.



Figures 141-149
(Figure 146 according to Ramme, the rest original)

141—Conophymacris chinensis Will., ♀, left tegmen, 142—Paraconophyma kashmiricum Mistsh., ♀, ibid 143—Conophyma nanum Mistshenko sp. n., ♂, head from the side, 144—C. nanum Mistshenko sp. n., ♀, ibid., 145—C. semenovi semenovi Zub., ♂, left hind tibiasfrom the side 146—Thaumatophyma cercatum Rme., ♂, tip of abdomen from above, 147—Conophyma nanum Mistshenko sp. n., ♂, ibid., 148—C. nanum Mistshenko sp. n., ♀, left cercus from the side, 149—C. almasyi almasyi (Kuthy), ♂, tip of abdomen from above.

either in their whole extent or only in some places (Figures 132, 133);
136 sometimes they are slightly separated, with a very narrow space between them, then hind femur has a rounded ventral genicular lobe.

27 (28). Tegmina in ♂ with a strongly expanded costal field; its greatest width 1.5-2 times greater than greatest width of precostal field. Mesothoracic lobes in both sexes contiguous in their whole extent (Figure 133). Subgenital plate in ♂ long; its length equals or is slightly greater than length of pronotum (Figure 134). Ovipositor in ♀ with long ventral valves; their outer ventral margin smooth; pulvilli with smooth apical margin. . . . . 13. Leptacris Walk.

28 (27). Tegmina in ♂ with slightly expanded costal field; its greatest width equals the greatest width of the precostal field. Mesosternal lobes in both sexes separated in anterior part (Figure 132). Subgenital plate in ♂ short; its length distinctly less than length of pronotum (Figure 135). Ovipositor in ♀ with short ventral valves; their outer ventral margin with callus-shaped denticles, pulvilli with callus-shaped denticles on apical margin (Figure 136) . . . 14. Tropidopola Stål.

29 (12). Tegmina absent or strongly abbreviated, lateral. Wings absent or barely discernible. Hind femur with rounded ventral genicular lobe.

30 (33). Prothoracic process wide, wedge-shaped, sometimes with a notch apically (Figure 137).

137 31 (32). Body smooth. Pronotum with slightly elevated median carina. Tegmina distinctly narrowed apically (Figure 138) . . . . 15. Pezotettix Burm.

32 (31). Body rugose. Pronotum with strongly elevated callus-shaped median carina. Tegmina expanded apically (Figure 139). . . . . 16. Sphenophyma Uv.

33 (30). Prothoracic process usually conical, pointed (Figure 140), sometimes in ♀ weakly developed.

34 (37). Tegmina lateral, strongly abbreviated.

35 (36). Pronotum with lateral carinas, developed for the whole extent, Tegmina wide; length of tegmen 1.5-2 times greater than its greatest width (Figure 141). Hind tibiae with 12-14 spines on outer dorsal margin. 17. Conophymacris Will.

36 (35). Pronotum with lateral carinas reaching only anterior or posterior transverse groove. Tegmina narrow; length of a tegmen 3-4 times greater than its greatest width (Figure 142). Hind tibiae with 9 spines on outer dorsal margin . . . . 18. Paraconophyma Uv.

37 (34). No tegmina; body completely apterous.

38 (39). Tympanic organ on first abdominal tergite distinct, open. . . . . 19. Bienkoa Mistsh.

39 (38). No tympanic organ on first abdominal tergite.

40 (45). Eyes large; vertical diameter of eye in ♂ slightly greater than subocular groove, in ♀ equal to it (Figures 143-144). Hind tibiae with outer apical dorsal spine (Figure 145).

41 (42). Abdomen in ♂ with last tergite entire, not split medially† (Figure 146) . . . . 20. Thaumatophyma Rme.

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† According to drawing by Ramme (1939, Mitt. Zool. Mus. Berlin, XXIV:148, Abb. 59a).

42(41). Abdomen in ♂ with last tergite split medially (Figure 147).

43(44) Mid-femora in ♂ slightly thickened. Cerci in ♂ when seen from above) narrow, long, laterally strongly compressed (Figure 147), in ♀ flat, in profile conical, gradually narrowing towards apex; Length of cercus in ♀ in profile always greater than its greatest width (Figure 148). Supraanal plate in ♂ triangular, square or trapezoidal, its greatest length slightly more, or smaller than its greatest width (Figures 147, 149, 150). Epiphallus in ♂ transverse, short; its greatest width several times greater than its greatest length (Figure 151) . . . . 21. Conophyma Zub.

44(43). Mid-femora in ♂ very strongly thickened. Cerci in ♂ (when seen from above) short, stout, not laterally compressed (Figure 152), in ♀ stout, although narrowed apically but apex itself produced and outward-projecting (Figure 153); length of cercus in ♀ in profile equals its greatest width. Anal plate in ♂ narrow and long; its greatest length almost 1.5 times greater than its greatest width (Figure 152). Epiphallus in ♂ narrow and long, its greatest width 2/3 its greatest length (Figure 154) . . 22. Tarbinskia Mistsh.

45(40). Eyes small, vertical diameter of eye in both sexes significantly less than subocular groove (Figure 155) Hind tibiae without outer apical dorsal spine (Figure 156) . . . . . . 23. Plotnikovia Um.

138 46 (1). Hind tibiae always without outer apical dorsal spine (Figure 157). Prosternal process usually cone-shaped or cylindrical, straight or strongly bent caudad, sometimes wedge-shaped, when there are no wings. Tegmina and wings either well-developed or tegmina abbreviated, when there are no wings or they are barely discernible. Tympanic organ on first abdominal organ usually distinct. Sometimes body is apterous and there is no tympanic organ, when width of vertex between eyes equals or is slightly greater than width of frontal ridge between antennae (Figure 158).

47(88). Hind femur with a smooth dorsal carina (Figure 159).

48(85). Pronotum either without lateral carinas or they are barely discernible, *when the posterior margin of the pronotum is rounded or almost straight.*

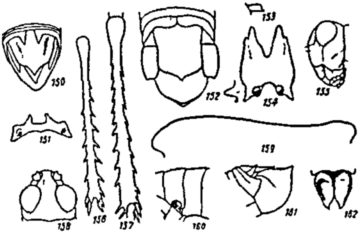
49(56). Body completely apterous. Pronotum either with a long anterior part, the length of which is 2.5-3.25 times greater than length of posterior part of pronotum or with a shorter anterior part, the length of which is 1.25-2 times greater than length of posterior part of pronotum, but then the tympanic organ is absent or very small, and barely discernible (Figure 160).

50(55). No tympanic organ on first abdominal tergite or it is very small, barely discernible (Figure 160).

139 51(54). Antennae in both sexes short, not reaching or hardly reaching posterior margin of pronotum. Cerci in ♂ short, in profile conical, reaching only the middle of the anal plate (Figure 161). Ovipositor in ♀ without teeth on apex of valves (Figure 162).

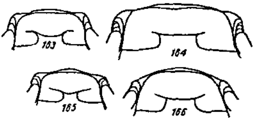
52(53). Pronotum with a very finely punctate, almost smooth anterior part. Mesosternum with a wide inter-lobal space, its narrowest part in ♂ 1.75, in ♀ 2.5 times greater than its length (Figures 163, 164) . . . . 24. Pachypodisma Dov.-Zap.

53(52). Pronotum with coarse, deeply punctate and slightly rugose anterior part. Mesosternum with a narrow inter-lobal space, its narrowest



Figures 150-162
(Original)

150—Conophyma nitens Mistshenko sp. n., ♂, tip of abdomen from above, 151—C. bogojavlenskii Tarb., ♂, epiphallus from above, 152—Tarbinskia cognata Mistsh., ♂, tip of abdomen from above; 153—T. cognata Mistsh., ♀, left cercus from above; 154—T. cognata Mistsh., ♂, epiphallus from above, 155—Plotnikovia lanigera Um., ♂, head from the side, 156—P. lanigera Um., ♂, left hind tibia from above; 157—Pachypodisma lezgina (Uv.), ♂, ibid.; 158—P. lezgina (Uv.), ♂, head from above, 159—P. crassa Mistsh., ♂, dorsal margin of left hind femur from the side; 160—Zubovskia parvula (Ikonn.), ♂, tympanic organ, 161—Cophopodisma pedemontana (Br.-W.), ♂, tip of abdomen from the side, 162—C. pedemontana (Br.-W.), ♀, ovipositor from above.



Figures 163-166. Mesothorax from below. (Original)

163—Pachypodisma lezgina (Uv.), ♂, 164—P. lezgina (Uv.), ♀, 165—Cophopodisma pedemontana (Br.-W.), ♂, 166—C. pedemontana (Br.-W.), ♀.

part in the ♂ is hardly greater than its length, in ♀ 1.5 times greater than it (Figures 165, 166). . . 25. Cophopodisma Dov.-Zap.

54(51). Antennae in both sexes long extending far beyond posterior margin of pronotum. Cerci in ♂ long, in profile in median part distinctly compressed, extending beyond the middle of anal plate (Figure 167). Ovipositor in ♀ with 2 teeth on apex of valves (Figure 168) . . . . 26. Zubovskia Dov.-Zap.

55(50). Tympanic organ on first abdominal tergite large, well-developed (Figure 169) . . . . 27. Micropodisma Dov.-Zap.

40 56(49). Tegmina and wings either well-developed or tegmina strongly abbreviated, lateral, then wings absent or they are barely discernible, sometimes both tegmina and wings absent, then length of anterior part of pronotum is 1.5 times greater than length of posterior part of pronotum along median carina and tympanic organ large, well-developed.

57(64). Pronotum with long anterior part, length of which 2.5-2.75 times greater than length of posterior part of pronotum along median carina, its posterior margin with a distinct triangular median notch (Figure 171)

58(61). Subgenital plate in ♂ conical, apically not swollen (Figures 172, 173). Ovipositor in ♀ with 2 denticles on apex of valves (Figure 174).

59(60). Pronotum in both sexes in anterior part almost without median carina. Tegmina covering tympanic organ. Subgenital plate in ♂ with a bluntly conical apex (Figure 172). 28. Odontopodisma Dov.-Zap.

60(59). Pronotum in both sexes in anterior part with weak but distinct median carina. Tegmina in both sexes not reaching tympanic organ. Subgenital plate in ♂ with apex produced in shape of conical cusp. (Figure 173). . . . . 29. Anapodisma Dov.-Zap

61(58). Subgenital plate in ♂ apically swollen, truncate, with distinctly thickened dorsal margin (Figure 175). Ovipositor in ♀ with pointed valves the apex of which is without teeth (Figure 176).

62(63). Tympanic organ on first abdominal tergite very small, barely discernible . . . . 30. Cophoprumna Dov.-Zap.

63(62). Tympanic organ on first abdominal tergite large, well-developed (Figure 177) . . . . 31. Primnoa F.-W.

64(57). Pronotum with short anterior part, the length of which is hardly or 1.5-2 times greater than length of posterior part of pronotum along median carina; its posterior margin rounded or slightly emarginate on median carina (Figure 178).

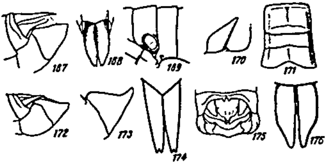
65(78). Eyes small, a short oval; vertical diameter of eye equals or is 1.25 times greater than horizontal diameter and 1.25-1.75 times greater than subocular groove (Figures 179-180).

41 66(67). Hind femur with a sharp spine on apex of dorsal carina (Figure 181). . . . . 32. Parapodisma Mistsh.

67(66). Hind femur without a spine on apex of dorsal carina (Figures 182).

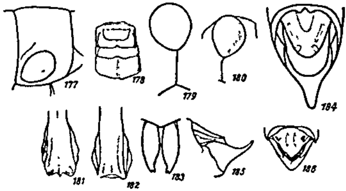
68(71). Pronotum in both sexes with long anterior part, length of which 1.75-2 times greater than length of posterior part of pronotum along median carina (Figure 178), sometimes in ♀ 1.5 times greater than this part, then valves of ovipositor with 2 teeth on apex (Figure 183).

69(70). Abdomen in ♂ with distinct lobules on posterior margin of last tergite (Figure 184). Subgenital plate in ♂ with the apex produced in shape



Figures 167-176
(Original)

167—Zubovskia koeppeni (Zub.), ♂, tip of abdomen from the side, 168—Z. koeppeni (Zub.), ♀, ovipositor from above; 169—Micropodisma koenigi (Burr), ♂, tympanic organ, 170—Kingdonella pictipes Uv., ♂, prothoracic process from the side, 171—Odontopodisma schmidti schmidti (Fieb.), ♂, pronotum from above, 172—O. schmidti schmidti (Fieb.), ♂, tip of abdomen from the side, 173—Anapodisma miramae Dov.-Zap., ♂, ibid.; 174—Odontopodisma schmidti schmidti (Fieb.), ♀, ovipositor from above, 175—Primnoa assimilis Mistsh., ♂, tip of abdomen from above, 176—P. assimilis Mistsh., ♀, ovipositor from above.



Figures 177-186
(Figures 181 and 182 according to Mishchenko, the rest original)

177—Primnoa assimilis Mistsh., ♂, tympanic organ; 178—Miramella solitaria (Ikonn.), ♂, pronotum from above, 179—M. solitaria (Ikonn.), ♂, left eye from the side, 180—Eirenephilus longipennis (Shir.), ♂, ibid.; 181—Parapodisma mikado (I. Bol.), ♂, distal end of left hind femur from above, 182—Miramella solitaria (Ikonn.), ♂, ibid., 183—M. alpina collina (Br.-W.), ♀, ovipositor from above, 184—M. solitaria (Ikonn.), ♂, tip of abdomen from above, 185—M. solitaria (Ikonn.), ♂, tip of abdomen from the side, 186—Pseudopodisma fieberi (Scudd.), ♂, tip of abdomen from above

of a conical cusp (Figure 185). Ovipositor in ♀ with 2 teeth on apex of valves (Figure 183) . . . . 33. Miramella Dov.-Zap.

70(69). Abdomen in ♂ without lobules on posterior margin of last tergite (Figure 186). Subgenital plate in ♂ with a blunt, slightly rounded apex (Figure 187). Ovipositor in ♀ without teeth on apex of valves (Figure 188) . . . . 34. Pseudopodisma Mistsh.

71(68). Pronotum with a short anterior part, length of which is hardly or 1.5 times greater than length of posterior part of pronotum along median carina (Figures 189, 190).

72(73). No tegmina or they are strongly abbreviated, lateral, hardly reaching first abdominal tergite. No wings or they are barely perceptible. Sometimes in f. macroptera tegmina and wings well-developed, then ventral aspect of hind femur is red and hind tibias blue. . . . . 35. Podisma Berth.

73(72). Tegmina and wings always more or less well-developed, reaching tip and middle of abdomen. Hind tibiae yellow, red, sometimes bluish, then ventral aspect of hind femur yellow.

142 74(75). Tegmina and wings in both sexes reaching only middle of abdomen, sometimes well-developed, then hind tibiae red. Cerci in ♂ in profile wide, apically slightly expanded (Figure 191)† . . . . 36. Melanoplus Stål.

75(74). Tegmina and wings in both sexes always reaching tip of abdomen. Hind tibiae in both sexes yellow or bluish. Cerci in ♂ in profile narrow, distinctly narrowed apically, cone-shaped (Figure 192).

76(77). Pronotum in ♀ with a long anterior part, length of which 1.5 times greater than greatest length of posterior part of pronotum (Figure 193). Hind femora in both sexes with a short genicular ventro-outer lobe, ventral margin of which is straight and ventral apical angle slightly produced (Figure 194). Cerci in ♂ straight, gradually narrowed apically, length of cercus in ♂ 2-2.25 times (Figure 195), in ♀ twice greater than its greatest width . . . . 37. Ognevia Ikonn.

77(76). Pronotum in ♀ with a short anterior part, the length of which equals or is hardly greater than the greatest length of posterior part of pronotum (Figure 190). Hind femora in both sexes with a longer genicular ventro-outer lobe, ventral margin of which is sinuous and ventral-apical angle distinctly produced (Figure 196). Cerci in ♂
143 bent inward, distinctly narrowed apically, length of cercus in ♂ 2.75-3 (Figures 192), in ♀ 3 times greater than its greatest width. . . . . 38. Eirenephilus Ikonn.

78(65). Eyes large, oval; vertical diameter of eye 1.5 times greater than its horizontal diameter and 1.5-2 times greater than subocular groove. (Figure 197).

79(82). Tegmina extending far beyond base of hind femora. Wings slightly shorter than tegmina.

80(81). Tegmina and wings well developed, reaching or extending beyond distal end of hind femora. . . . . . . 39. Fruhstorferiola Will.

81(80). Tegmina and wings strongly abbreviated, not reaching middle of hind femora. . . . . 40. Tonkinacris Carl

82(79). Tegmina either lateral, narrow, hardly reaching base of hind femora, or they are completely absent. Wings barely discernible or completely absent.

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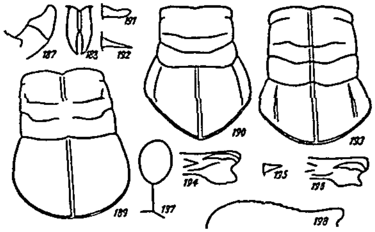
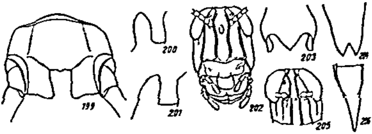
† In some American species cerci in ♂ cone-shaped but always wide at base



Figures 187-198
(Original)

187—Pseudopodisma fieberi (Scudd.), ♂, genital plate from the side, 188—P. fieberi (Scudd.), ♀, ovipositor from above; 189—Podisma pedestris pedestris (L.), ♂, pronotum from above, 190—Eirenephilus longipennis (Shir.), ♂, ibid.; 191—Melanoplus frigidus frigidus (Boh.), ♂, left cercus from the side; 192—Eirenephilus longipennis (Shir.), ♂, ibid.; 193—Ognevia sergii sergii Ikonn., ♀, pronotum from above; 194—O. sergii sergii Ikonn., ♂, distal end of left hind femur from the side, 195—O. sergii sergii Ikonn., ♂, left cercus from the side, 196—Eirenephilus longipennis (Shir.), ♂, distal end of left hind femur from the side, 197—Fruhstorferiola viridifemorata (Caud.), ♂, left eye from the side, 198—Metromerus coelesyriensis hissaricus Mistshenko subsp. n., ♂, dorsal margin of left hind femur from the side (type).



Figures 199-206
(Original)

199—Anacridium aegyptium aegyptium (L.), ♂, mesothorax from below, 200—A. aegyptium aegyptium (L.), ♂, prothoracic process from the side; 201—Valanga nigricornis melanocornis (Serv.), ♂, ibid.; 202—Anacridium aegyptium aegyptium (L.), ♂, head, front view; 203—A. aegyptium aegyptium (L.), ♂, apex of genital plate from below, 204—Schistocerca gregaria (Fõrsk.), ♂, ibid.; 205—Patanga japonica (I. Bol.), ♂, head, front view; 206—P. japonica (I. Bol.), ♂, genital plate from below.

83 (84). Vertex in front of eyes hardly expanded; its greatest width before the eyes equals or is hardly wider than width of frontal ridge between antennae. Pronotum with deep and wide transverse grooves. Tegmina hardly perceptible, far from reaching tympanic organ or
144 completely absent. Abdomen in ♂ with distinct thin, pointed lobules on posterior margin of last tergite. 41. Indopodisma Dov.-Zap.

84 (83). Vertex in front of eyes distinctly expanded, its greatest width before eyes significantly wider than width of frontal ridge between antennas. Pronotum with slightly depressed narrow transverse grooves, which are sometimes almost effaced Tegmina although lateral, always reaching or extending beyond tympanic organ. Abdomen in ♂ without lobules on posterior margin of last tergite. . . . . .42. Sinopodisma Chang.

85 (48). Pronotum with distinct lateral carinae, its posterior margin angularly incised near median carina.

86 (87). Tegmina lateral, oval. Prothoracic process transverse, wedge-shaped, apically distinctly emarginate. 43. Dicranophyma Uv.

87 (86). Body completely apterous. Prothoracic process conical (Figure 170), with pointed or blunted apex. . . . . . 44. Kingdonella Uv.

88 (47) Hind femora with finely dentate dorsal carina (Figure 198).

89(100). Mesosternal lobes narrow and long, length of a lobe distinctly greater than its greatest width (Figure 199).

90 (99). Prosternal process straight, vertical or only slightly bent in direction of mesothorax, far from reaching the latter, laterally compressed (Figures 200, 201).

91 (94). Frontal ridge in both sexes slightly expanded, above median ocellus distinctly wider than immediately below it (Figure 202). Subgenital plate in ♂ with 1-2 deep incisions on apex (Figures 203, 204).

92 (93). Pronotum in both sexes with a low median carina, almost obliterated in anterior part. Tegmina in both sexes without median dark band. Subgenital plate in ♂ bilobate, with one triangular incision on apex (Figure 204). . . . . 45. Schistocerca Stål.

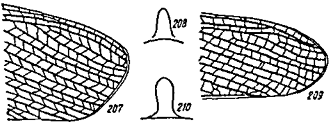
93 (92). Pronotum in both sexes with high median carina, comb-shapedly
145 elevated in anterior part. Tegmina in both sexes with a median smoky band. Subgenital plate in ♂ trilobate, with 2 rounded incisions on apex (Figure 203). . . . . .46. Anacridium Uv.

94 (91). Frontal ridge in both sexes not expanded above median ocellus, its margins almost parallel to each other (Figure 205). Subgenital plate in ♂ conical, pointed, without apical incisions (Figure 206).

95 (96). Tegmina with oblique venation in apical part, transverse veins situated obliquely to principal veins (Figure 207). Hind tibiae with 7 spines on outer dorsal margin Prosternal process conical (Figure 208) .47. Pachyacris Uv.

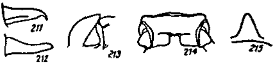
96 (95). Tegmina with a straight venation in apical part, transverse veins forming almost right angle with principal veins (Figure 209) Hind tibiae with 8 spines on outer dorsal margin Prosteral process almost cylindrical, with rounded apex (Figure 210)

97 (98). Pronotum in both sexes with a high median carina. Hind femora in both sexes short and wide, length of a femur 4.5 times greater than its greatest width. Cerci in ♂ wide at base, distinctly narrowed apically (Figure 211). . . . . .48 Valanga Uv.



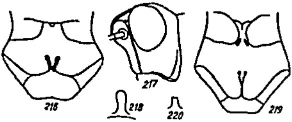
Figures 207-210
(Original)

207—Pachyacris vinosa (Walk.), ♀, apex of right tegmen;
208—P. vinosa (Walk.), ♀, prosternal process, front view,
209—Patanga japonica (I. Bol.), ♂, apex of right tegmen,
210—P. japonica (I. Bol.), ♀, prosternal process, front view.



Figures 211-215
(Original)

211—Valanga nigricornis melanocornis (Serv.), ♂, left cercus from the side; 212—Patanga japonica (I. Bol.), ♂, ibid.; 213—Chondracris rosea (De Geer), ♀, prosternal process from the side, 214—Calliptamus italicus italicus (L.), ♂, mesothorax from below, 215—Traulia orientalis szetschuanensis Rme., ♂, prosternal process, front view.



Figures 216-220
(Original)

216—Traulia orientalis szetschuanensis Rme., ♂, metathorax from below; 217—T. orientalis szetschuanensis Rme., ♂, head from the side, 218—Catantops splendens (Thunb.), ♂, prosternal process, front view, 219—C. splendens (Thunb.), ♂, metathorax from below, 220—Paracaloptenus caloptenoides (Br.-W.), ♂, prosternal process, front view.

98 (97). Pronotum in both sexes with low median carina. Hind femora in both sexes long and narrow, length of a femur 5.5-6 times greater than its greatest width. Cerci in ♂ narrow at base, gradually and slightly narrowed apically (Figure 212). 49. Patanga Uv.

99 (90). Prothoracic process strongly bent at an angle, directed backwards toward mesothorax, reaching the latter (Figure 213) . . . . 50. Chondracris Uv.

100 (89). Mesosternal lobes wide and short; length of lobe equals or distinctly less than its greatest width (Figure 214).

146 101 (108). Pronotum without lateral carinae or they are barely discernible in anterior part, then hind tibiae with 8-10 spines on outer dorsal margin.

102 (103). Tegmina strongly abbreviated, lateral, lobe-shaped No wings or they are barely discernible . . . . 51. Kabulia Rme.

103 (102). Tegmina and wings well developed or only slightly abbreviated, always extending beyond base of hind femora.

104 (107). Prosternal process conical, with pointed apex (Figure 215) Metathoracic lobes distinctly separated in posterior part (Figure 216).

105 (106). Frontal ridge in both sexes in profile strongly projecting anteriorly between antennae (Figure 217). Vertex in both sexes wide; its width between eyes 2 times greater than width of frontal ridge between antennae Antennae in ♂ short and stout, 1.5 times greater than length of head and pronotum together. 52. Traulia Stål.

106 (105). Frontal ridge in both sexes in profile flat between antennae, not projecting anteriad Vertex in both sexes narrow, its width between eyes almost equals the width of frontal ridge between antennae. Antennae ♂ long and thin, 3 times greater than length of head and pronotum together. . 53. Apalacris Walk.

107 (104). Prosternal processes cylindrical, with an obtuse-rounded apex (Figure 218). Metathoracic lobes contiguous in posterior part (Figure 219) . . . . 54. Catantops Schaum.

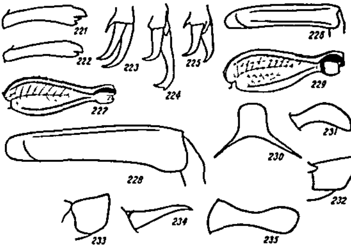
108 (101). Pronotum with distinct lateral carinas in anterior part, sometimes they are weak, then hind tibiae with 14-16 spines on outer dorsal margin.

109 (118). Hind femora in both sexes short and wide, length of femur 2.8-3.8 times greater than its greatest width, sometimes femora more slender, and length of a femur 4 times greater than its greatest width, then tegmina strongly abbreviated, lateral, wings hardly perceptible and prosternal processes bluntly conical (Figure 220). Cerci in ♂ apically divided into 2 lobes, ventral lobe sometimes with 2 teeth on apex (Figures 221, 222).

110 (111). Tegmina strongly abbreviated, lateral, hardly reaching first abdominal tergite. Wings barely discernible. . . . . 55. Paracaloptenus I. Bol.

111 (110). Tegmina and wings well-developed or slightly abbreviated but always reaching middle of abdomen.

147 112 (113). Pronotum in both sexes in posterior part with distinct lateral carinae reaching its posterior margin. Hind tibiae in both sexes with a short inner spur on inner margin of dorsal aspect, its length insignificantly greater than outer spur of inner margin



Figures 221-235
(Original)

221—Calliptamus italicus italicus (L.), ♂, left cercus from the side; 222—Metromerus coelesyriensis angustus (Uv.), ♂, ibid., 223—Calliptamus italicus italicus (L.), ♀, spurs of the inner margin of left hind tibia, 224—Acorypha insignis (Walk.), ♀, ibid.; 225—Metromerus coelesyriensis carbonarius (Uv.), ♀, ibid.; 226—M. coelesyriensis carbonarius (Uv), ♀, outer aspect of left mid-femur, 227—M. coelesyriensis angustus (Uv.), ♀, outer aspect of left hind femur; 228—Sphodromerus luteipes rubripes Uv., ♀, outer aspect of left mid-femur, 229—S. luteipes rubripes Uv., ♀, outer aspect of left hind femur, 230—Habrocnemis sinensis Uv., ♀, prosternal process, front view; 231—Thisoicetrus adspersus (Redt.), ♂, left ceruci from the side, 232—Thisoicetrinus pterostichus (F.-W.), ♂, genital plate from the side, 233—Thisoicetrus persa Uv., ♂, ibid.; 234—Euprepocnemis plorans (Charp.), ♂, left cercus from the side, 235—Eu. shirakii I. Bol., ♂, ibid.

(Figure 223). Cerci in ♂ with 2 teeth on apex of ventral lobe (Figure 221) . . . . 56. Calliptamus Serv.

113(112). Pronotum in both sexes in posterior part usually with effaced lateral carinae, almost always not reaching its posterior margin, if reaching it then hind tibiae with a long inner spur on inner margin of dorsal aspect; its length 1.5-2 times greater than outer spur of inner margin (Figure 224). Cerci in ♂ without teeth on apex of ventral lobe (Figure 222).

114(117). Hind tibiae with a short inner spur on inner margin of dorsal aspect; its length slightly greater than outer spur of inner margin (Figure 225).

115(116). Pronotum with distinct lateral carinae, just not reaching its posterior margin. Mid-femora with 2 distinct grooves on outer aspect (Figure 226). Hind femora moderately wide; outer-ventral field of femur not expanded behind middle, outer-ventral genicular lobe elongated, not wide. (Figure 227). . . . . 57. Metromerus Uv.

116(115). Pronotum with lateral carinae effaced almost everywhere, sometimes they are weakly developed only in anterior part. Mid-femora with one dorsal groove on outer aspect (Figure 228). Hind femora very wide, outer-ventral field of femur distinctly expanded behind middle, outer-ventral genicular lobe short and wide (Figure 229) . . . . 58. Sphodromerus Stål.

117(114). Hind tibiae with a long inner spur on inner margin of dorsal aspect, its length 1.5-2 times greater than outer spur of inner margin (Figure 224) . . . . 59 Acorypha Kr.

118(109). Hind femora in both sexes slender, narrow, length of a femur 5-5.5 times greater than its greatest width, sometimes femora stouter and length of a femur almost 4 times greater than its greatest width, then either the tegmina and wings are well developed or prosternal process in shape of elliptical cylinder (Fig-
148 ure 230). Cerci in ♂ complete, not split into 2 lobes at apex (Figure 231).

119(124). *Tegmina and wings well-developed*

120(123) Hind tibiae in both sexes with 14-16 spines on outer dorsal margin. Cerci in ♂ flattened, wide, apically rounded and strongly bent ventrad (Figure 231).

121(122). Antennae in both sexes long, in ♂ 2, in ♀ 1.25 times greater than length of head and pronotum together. Pronotum in both sexes with very weak lateral carinae Subgenital plate in ♂ long, slightly pointed (Figure 232) . . . . 60 Thisoicetrinus Uv.

122(121). Antennae in both sexes shorter, in ♂ 1.5 times greater than head and pronotum together, in ♀ equal to it. Pronotum in both sexes with distinct lateral carinae Subgenital plate in ♂ short, rounded
149 (Figure 233), sometimes with 2 tubercles on apex . . . . 61. Thisoicetrus Br.-W

123(120). Hind tibiae in both sexes with 9-11 spines on dorso-outer margin. Cerci in ♂ narrow, pointed, very slightly bent ventrad (Figure 234), sometimes medially compressed, expanded towards base and apex (Figure 235). . . . 62. Euprepocnemis Fieb

124(119). Tegmina strongly abbreviated, wings barely discernible . . . . 63. Habrocnemis Uv.

149 1. Genus Uvarovium Dirsh

Dirsh, 1927, Bol. R. Soc. Esp. Hist. Nat., XXVII:298, Uvarov, 1927a:167, 171; Mishchenko, 1945:38.
Type of genus: Uvarovium desertum Dirsh.

Head short; considerably shorter than the pronotum. Pronotum with a low linear median carina for its whole length. Tegmina and wings rather well developed. Hind tibiae with an external spine on the dorsal aspect and with 16-22 spines on the outer dorsal margin. Prothorax with a sharp process between the coxae of forelegs; the process is weakly curved and widened toward the bluntly rounded apex. Lobes of meso- and metasternum strongly converging, very weakly separated, or contiguous. First abdominal tergite with a large uncovered tympanic organ. Subgenital plate of the ♂ short, considerably shorter than the pronotum.

3 species are known, living in Turkmenia and in Iran.

1(2). Head in both sexes large, strongly projecting forward. Hind femora in both sexes slender [i.e., well-shaped]; femur nearly 5 times longer than its greatest width. ♂ 16.9-19.1 mm long, ♀ 26.6-27.8 mm long; tegmina of ♂ 7.2-8.3, of ♀ 11.8-11.9 mm. —Turkmenia: Sary-yazy, Imam-baba (!), Yola-tan, Uch-adzhi. (Figure 236). . . . . *1. U. desertum Dirsh.

Dirsh, 1927, Bol. R. Soc. Esp. Hist. Nat., XXVII:299, Figures 2, 3a-g, Uvarov, 1927a:172, Figure 218a; Mishchenko, 1945:39, 40, 42.

2(1). Head of ♀ small, slightly projecting forward. Hind femora of ♀ stouter; length of femur 4 times more than its greatest width. ♂ unknown. ♀ 26.5 mm long, tegmina 10.8 mm long. —Northern Iran: Khorasan (Bukhsana). . . . . 2. U. femorale Mistsh.

Mishchenko, 1945:40, 41, 42.

150 2. Genus Dericorys Serv.

Serville, 1839, Hist. Nat. Ins. Orth.:568, 638, Uvarov, 1927a 166, 170, Tarbinskii, 1940:20, 147, 150, Tarbinskii, 1948:108, 110. —Cyphophorus Fischer-Waldheim, 1846:253. —Derocorystes Redtenbacher, 1889, Wien. Ent. Zeitg., VIII 29. —Derocorys Jakobson, 1905:172, 201, 299.
Type of genus: Dericorys lobata (Brullé), Canary Is.

Foveolae distinct, situated near the fastigium. Pronotum smooth in the anterior part with a pectinate median carina, anterior transverse groove absent; median transverse groove hardly perceptible. Tegmina and

wings well developed. Hind tibiae with external distal spine on the dorsal aspect and with 9-12 spines on the external dorsal margin. Prosternum with a distinct process. Abdomen with a large uncovered tympanic organ on the first tergite. Ovipositor in the ♀ with a deep sharp incision on the dorso-external margin of the dorsal valves.

About 10 species, distributed in desert stations of the Canary Islands, North Africa, the southeastern part of the Iberian peninsula, the Caucasus, Kazakhstan, Hither and Middle Asia are known.

1 (2). Wings with a smoky spot near the apex. Hind tibiae red near the distal end on the inner side. Pronotum with a very high pectinate rounded median carina in the anterior part. Wings at the base yellow-greenish. Hind tibiae long, extending beyond the base of the hind femora Mesosternum with a nearly rectangular space between the lobes, its narrowest part is considerably less than its length Length of ♂ 42.5-51.2, of ♀ 49.6-57.1 mm, of tegmina in the ♂ 39.4-51.1, in the ♀ 52.8-65.4 mm. —Middle Asia, North Africa, Syria, Iraq, Iran, northern Afghanistan, western Pakistan. In years of reproduction en masse it is very injurious to haloxylon in Middle Asia, and sometimes to crops. . . . . *1. D albidula Serv —Large hump-backed Haloxylon grasshopper [Gorbatka bol'shaya saksaulovaya]

Serville, 1839, Hist. Nat. Ins. Orth. 639 Jakobson, 1905:201, 300 (Derocorys) Uvarov, 1927a:170, Figures 201, 203. —tibialis Fieber, 1853, Lotos, III:121 (Cyphophorus) (nec Pallas) Jakobson, 1905:300 (Derocorys) (not Pallas). —acutispina Stål, 1875, Bih. Sven. Vet.-Akad. Handl., III 14 27 (Dericoris). —curvipes Redtenbacher, 1889, Wien. Ent. Zeitg , VIII 29 (Derocorystes) Jakobson, 1905: 201, 300, plate X (Derocorys).

Biology: Predtechenskii, Zhdanov and Popova, 1935:87, Zimin, 1938:38, 76, plate V, Figure 28, plate X, Figure 55, Mishchenko, 1949b 164.

151 2 (1). Wings without a smoky apical spot. Hind tibiae not red on the inner side near the distal end.

3 (4) Wings with wide diffuse dark median band Pronotum with a high rounded pectinate median carina in the anterior part Wings blue at the base. Hind tibiae long, extending beyond the base of the hind femora Mesosternum with a nearly quadrate space between the lobes, its narrowest part nearly equal to its length Length of ♂ 18 8-25 3, of the ♀ 26.9-38.6 mm, of tegmina ♂ 18.4-23.1, ♀ 25.8-33.1 mm —The Caucasus, Kazakhstan, Middle Asia, Asia Minor, Iraq, Iran, northern Afghanistan (Figure 237) . . . . *2. D. tibialis (Pall.)—Stained humpbacked grasshopper [Gorbatka pyatnistaya].

Pallas, 1773, Reise durch versch. Prov. d. Russ Reichs, II 728 (Gryllus Locusta), Uvarov, 1927a 170, Tarbinskii, 1940:20, 150, Figure 128, Tarbinskii, 1948 110, Figure 138 —gibbosum Fischer-Waldheim, 1839, Bull. Soc. Imp. Nat. Moscou 301 (Acridium) —maculatus Fischer-Waldheim, 1846 254, tab. XIX, Figures 3-4 (Cyphophorus). —maculata Jakobson, 1905 201, 300 (Derocorys). —fumeipennis Adelung, 1906, Materialy k poznaniyu fauny i flory Rossiiskoi imperii, Otdelenie Zoologii, VII:88 (Derocorys).

Figure 236. Uvarovium desertum Dirsh, ♂. (Original)

Figure 237. Dericorys tibialis (Pall.), ♂. (Original)

Figures 238, 239. Mesosternum from below. ♀. (Original)

238—Dericorys annulata roseipennis (Redt.), 239—D. uvarovi uvarovi Rme.

4 (3). Wings without a dark median band.

5 (6). Mesosternum with a nearly right-angled space between the lobes, hardly narrowed at the base, its widest part almost equal to or hardly greater than its narrowest part (Figure 238). Pronotum with a high pectinate rounded median carina. Hind tibiae long, extending beyond the base of the hind femora . . . . *3. D. annulata (Fieb.)

a(b). Wings bluish, blue-violet, violet, or violet-rose at the base Length of ♂ 32.4-38.3, of the ♀ 42 2-55 7 mm, of tegmina ♂ 29.7-33.9, ♀ 34.1-53.5 mm. —Iran.3a. D. annulata annulata (Fieb.)

—annulatus Fieber, 1853, Lotos, III:121 (Cyphophorus). —annulata Jakobson, 1905:300 (Derocorys). —roseipennis lazurescens Uvarov, 1914, Izvestiya Kavkazskogo muzeya, VIII:142, 146 (Derocorys).

b(a). Wings rose-colored at the base. Length of ♂ 25.1-36.2, of the ♀ 34.6-44.4 mm, of tegmina ♂ 24.3-37.1, ♀ 28.8-43.4 mm. —Southern Kazakhstan, Middle Asia, western China, northwestern Mongolia. In years of en masse reproduction greatly injures Haloxylon in Middle Asia *3b D annulata roseipennis (Redt)—Small, Haloxylon humpbacked grasshopper [Gorbatka malaya saksaulovaya].

—roseipennis Redtenbacher, 1889, Wien, Ent. Zeitg., VIII 30 (Derocorystes) Jakobson, 1905 201, 300 (Derocorys), Uvarov, 1927a:170, 171, Figure 204.

Biology: Predtechenskii, Zhdanov and Popova, 1935 87, Bei-Bienko, 1948, Izvestiya AN Kazakhskoi SSR, seriya zoologicheskaya, 8:193 Mishchenko, 1949b:317.

6 (5). Mesosternum between the lobes with a heart-shaped space, its greatest width 1.5 to twice greater than its narrowest part (Figures 239-241).

152 7 (8). Pronotum in the ♀ with a strongly elevated median rounded carina anteriorly (Figure 242). Hind tibiae in the ♂ short, only reaching the base of the hind femora. Mesosternum in both sexes flat in the middle of the anterior part. . . . . *4. D. uvarovi Rme.

a(b) Vertex of ♂ narrow, its width between the eyes 1.25 times greater than the width of the frontal ridge between the antennae, in the ♀ it is distinctly depressed with sharp lateral margins. Wings in both sexes rose-colored at the base. Length of ♂ 15.0-22.2, of ♀ 20.5-32 5 mm, of tegmina ♂ 14.5-17.9, ♀ 18.7-26.2 mm. —Transcaucasia . . . . *4a. D. uvarovi uvarovi Rme.

—uvarovi Ramme, 1930, Mitt. Zool. Mus. Berlin, XVI 395, Tarbinskii, 1940:20, 150, 151.

b(a). Vertex of ♂ wide, its width between the eyes 1.5 times greater than the width of the frontal ridge between the antennae, in the ♀ it is nearly flat, with hardly developed lateral margins. Wings of both sexes blue at the base, sometimes rose-colored in the ♂ with a faint violet tinge. Length of ♂ 16.0-19 9, ♀ 29.2-32.4 mm, of tegmina ♂ 14.2-18.8, ♀ 25.2-27.5 mm. —Iran Faragan, Yezd, Fars, Laristan (Type from Fars). . . . . 4b. D. uvarovi iranica Mistshenko subsp. n.

8 (7). Pronotum in the ♀ with weakly elevated median carina in the anterior part (Figures 243-244). Hind tibiae in the ♂ long, extending beyond the base of the hind femora. Mesosternum of both sexes distinctly swollen in the middle in the anterior part.

9 (10). Pronotum anteriorly with a round median carina (Figure 243). Mesosternum with a wide space between the lobes, weakly narrowed toward the anterior margin; its greatest width in both sexes is 4/7 to 2/3 its length (Figure 240). Wings colorless, with blue veins. Length of ♂ 19.3-21.2, of ♀ 30.7-41.6 mm; of tegmina ♂ 17.4-18.3, ♀ 28.2-31.6 mm. —Eastern Iran: southern Khorasan, southern Kerman, Iranian Baluchistan . . . . . . 5. D. cyrtosterna Uv.

Uvarov, 1933, Trudy Zoologicheskogo Instituta AN SSSR, (1932), I:220, Figure 11.

10 (9). Pronotum with a median carina in the anterior part, angularly elevated in the middle (Figure 244). Mesosternum with a narrower space between the lobes which is distinctly narrowed toward the anterior margin; its greatest width in both sexes is 1/2 to 4/7 its length (Figure 241). Wings colorless or red at the base. Length of ♂ 16.4-20.0, ♀ 32.3-34.5 mm; of tegmina ♂ 14.5-21.0, ♀ 27.5-36.2 mm. —Eastern Iran: central Khorasan, southern Kerman, Iranian Baluchistan . . . . 6. D. xenosterna Uv.

Uvarov, 1933, Trudy Zoologicheskogo Instituta AN SSSR, (1932), I:221, Figure 12.

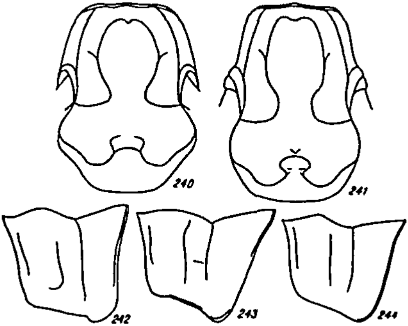
3. Genus Farsinella B.-Bienko

Bei-Bienko, 1948, Proc. R. Ent. Soc. Lond., (B), XVII, 5-6:70.
Type of genus: Farsinella uvarovi B.-Bienko.

Foveolae in the ♀ distinct, situated on the fastigium. Pronotum of ♀ anteriorly with distinct rugae and punctures and with a low median carina; both anterior transverse grooves distinct. Tegmina and wings well developed in the ♀; the tegmina extend beyond the distal end of the hind femora. Hind tibiae in the ♀ with a distal external spine dorsally and with 11 spines on the outer dorsal margin. Prosternum of the ♀ without a median process on the anterior rounded margin. Ovipositor of ♀ with a distinct deep incision on the dorsal outer margin of the dorsal valves. ♀ abdomen with a large uncovered tympanic organ on the first tergite. The ♂ is unknown.

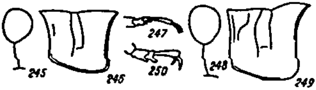
Two species are known from southeastern Iran.

1 (2). Eyes of ♀ small; vertical diameter of the eye 1.25 times greater that the horizontal diameter (Figure 245). Frontal ridge in the ♀ in the lower third completely effaced. Lateral lobes of ♀ pronotum with low rounded margin (Figure 246). Front tarsi of ♀ with a long thin third segment; its greatest length without the claw is considerably greater than the greatest length of the other 2 segments together (Figure 247). ♂ unknown. Length of ♀ 17.5-20.2, of tegmina 16.0-18.2 mm. —Eastern Iran: Kerman (!), Iranian Baluchistan. . . . . 1. F. uvarovi B.-Bienko.



Figures 240-244
(Original)

240—*Dericorys cyrtosterna* Uv., ♀, meso- and metasternum from below; 241—*D. xenosterna* Uv., ♀, ibid., 242—*D. uvarovi iranica* Mistshenko subsp. n., ♀, pronotum from the side (allotype), 243—*D. cyrtosterna* Uv., ♀, ibid., 244—*D. xenosterna* Uv., ♀, ibid.



Figures 245-250
(Original)

245—*Farsinella uvarovi* B.-Bienko, ♀, left eye from the side, 246—*F. uvarovi* B.-Bienko, ♀, pronotum from the side, 247—*F. uvarovi* B.-Bienko, ♀, right front tarsus from the side, 248—*F. predtetshenskii* B.-Bienko, ♀, left eye from the side, 249—*F. predtetshenskii* B.-Bienko, ♀, pronotum from the side, 250—*F. predtetshenskii* B.-Bienko, ♀, right front tarsus from the side

Bei-Bienko, 1948, Proc. R. Ent. Soc. Lond., (B), XVII, 5-6:70, Figures 5-6 (not 4).

154 (1). Eyes of ♀ larger; vertical diameter of the eye 1.5 times greater than the horizontal diameter (Figure 248). Frontal ridge of ♀ in the lower third although weakly depressed, distinct. Lateral lobes of pronotum of ♀ with obtuse-angled ventral carina (Figure 249). Front tarsi of ♀ with shorter and stouter third segment; its greatest length (without the claw) equal to the greatest length of the other 2 segments together (Figure 250). The ♂ *is unknown.* Length of ♀ 22, of tegmina 17.7 mm. —Eastern Iran: southern Kerman. . . . . 2. F. predtetshenskii B.-Bienko.

—predtetshenskyi Bey-Bienko, 1948, Proc. R. Ent. Soc. Lond., (B), XVII, 5-6:71, Figure 4 (not 5 and 6).

4. Genus Bufonacridella Ad.

Adelung, 1910, Trudy Russkogo entomologicheskogo obshchestva, XXXIX:338; Uvarov, 1927a:112, 159.

Body flattened. No feveolae. Frons in profile very slightly inclined. Pronotum with a low linear median carina. Tegmina strongly abbreviated. Wings hardly perceptible. Hind tibiae with an external distal spine dorsally and with 11-12 spines on the outer dorsal margin; spines in the lower part of the tibia long, strongly projecting outward. Prothorax smooth between the coxae of the forelegs, with the anterior margin raised a little like a plate. Metasternum wide; its greatest width considerably greater than the length of the meso- and metasternum together. Ovipositor in the ♀ with apically widened dorsal valves which are considerably longer than its ventral valves in length; dorsal outer margin of dorsal valves entire, without a median incision.

Only one species, found in Turkmenia, is known.

155 1(1). Vertex narrow; its width between the eyes hardly greater than the width of the frontal ridge between the antennae. Hind femora slender; femur 5 times as long as its greatest width. Mesosternum with a wide space between the lobes; its greatest width 2.5 times greater than its *length. Length of* ♂ 9.5-10.8, ♀ 15.2-18.7 mm; of tegmina in the ♂ 1.6-1.7, ♀ 3.9-6.1 mm. —Turkmenia: Iolatan (!), Repetek, Kerki (!). (Figure 251). . . . . *1. B. sumakovi Ad.

Adelung, 1910, Trudy Russkogo entomologicheskogo obshchestva, XXXIX:339, plate XV, Figures 4, 4a-b, Uvarov, 1927a:159, Figures 194-195.

5. Genus Diexis Zub.

Zubovskii, 1899, Trudy Russkogo entomologicheskogo obshchestva, XXXII:594, Jakobson, 1905:172, 201, 301; Uvarov, 1927a:167, 174, Umnov, 1931, Wien. Ent. Zeitg., XLVIII.187, Mishchenko, 1950b:206.
Type of genus: Diexis varentzovi Zub.

Body slender No foveolae. Frons in profile strongly sloping Pronotum with a low linear median carina. Tegmina usually strongly abbreviated, but sometimes well developed. Wings usually hardly perceptible, sometimes well developed. Hind tibiae dorsally with an external distal spine and 9-13 spines on the outer dorsal margin, spines in the lower part of the tibia long, strongly projecting outward. Prosternum with a short cone-like process between the coxae of the forelegs. Metathorax narrow, its greatest width 1/2 to 2/3 the length of the meso- and metathorax combined. Ovipositor in the ♀ with dorsal valves widened toward the tip, considerably longer than its ventral valves; dorsal outer margin of dorsal valves entire, without a median incision.

7 species, distributed in southern Kazakhstan, Middle Asia, northern Iran, and northern Afghanistan, are known.

1(6). Tegmina lateral, never overlapping each other at the base, distinctly spaced on the median-dorsal line [or dorsum].

2(5). Tegmina in both sexes not reaching the tympanic organ, in the ♀ sometimes almost reaching the posterior margin of the first abdominal tergite, then the posterior part of the pronotum is not swollen and the narrowest part of the space between the lobes of the mesosternum is equal to its length (Figure 252).

3(4). Vertex in the ♀ short, in profile it projects slightly forward (Figure 253). Pronotum in the ♀ with a swollen posterior part. ♂ unknown. Length of ♀ 19.5, of tegmina 1.4 mm. —Western Uzbekistan, Kharchaibarod near Staraya Bukhara. . . . . *1. D. bucharicus Mistsh.

Mishchenko, 1950b 208, Figure a.

4(3). Vertex in both sexes elongated, in profile strongly projecting forward (Figure 254). Posterior part of pronotum in the ♀ with a flat, not swollen, posterior part. Length of ♂ 10.3-11.5, of ♀ 16.4-19.1 mm; of tegmina ♂ 1.0-1.3, ♀ 2.3-3.5 mm. —Southern Kazakhstan Solotiube, Dzhulek, Baigakum . . . . *2. D. uvarovi Tarb.

Tarbinskii, 1932, Izvestiya Leningradskogo Instituta po bor'be s vreditelyami sel'skogo i lesnogo khozyaistva, 2:202, Figures 10-12 Mishchenko, 1950b:208, 209, Figure 6.

156 5(2). Tegmina in the ♂ always extending beyond the tympanic organ, in the ♀ always extending beyond the posterior margin of the first abdominal tergite. Pronotum in the ♀ with a swollen posterior part, sometimes slightly so, then the narrowest part of the space between the lobes of the mesosternum is considerably less than its length (Figure 255). . . . . *3. D. varentzovi Zub.

a(f). Vertex in the ♂ long, its length from fastigium to the anterior margin of the eye is greater than its greatest width, sometimes equal to it, then the fastigium is oval (Figure 256). Ovipositor in the ♀ with a stout short distal cusp on the ventral valves (Figures 257).

b(e). Vertex in the ♂ long, its length from fastigium to the anterior margin of the eye greater than its greatest width (Figure 259). Hind femora in the ♀ very slender, length of femur 7.0-7.5 times greater than its greatest width

c (d). Tegmina wide; length of tegmina 3 times greater than its greatest width. Length of ♂ 13.5-14.0, ♀ 26-29 mm; of tegmina ♂ 1.7-2.0, ♀ 5.5-6.5 mm. —Southwestern Turkmenia: Krasnovodsk, Uzun-ada (Figure 263) . . . . *3a. D. varentzovi varentzovi Zub.

—varentzowi Zubovskii, 1899, Trudy Russkogo entomologicheskogo obshchestva, XXXII:595; Jakobson, 1905:201, 302, Figures 33-34, Uvarov, 1927a:175, Figure 225-226 (partim); Umnov, 1931, Wien. Ent. Zeitg., XLVII:189, 203 (partim); Mishchenko, 1950b:208, 209, Figure e.

d (c). Tegmina narrower; length of tegmen nearly 4 times greater than
157 its greatest width. Length of ♂ 14.1-16.4, ♀ 19.6-30.6 mm; of tegmen ♂ 1.8-2.8, ♀ 4.1-5.2 mm. —Eastern Turkmenia: Imam-baba, Uch-adzhi, Repetek, Farab; western Uzbekistan: Khodzha-davlet. . . . . *3b. D. varentzovi probus *Mistsh.*

Mishchenko, 1950b:208, 210, Figure d.—varentzowi Uvarov, 1927a:175 (partim); Umnov, 1931, Wien. Ent. Zeitg., XLVII:189, 203 (partim).

e (b). *Vertex in the ♂ short; its length from fastigium to the anterior* margin of the eye nearly equal to its greatest width (Figure 256). Hind femora in the ♀ stouter; length of femur 5.8-6.3 times great*er than its greatest width. Length of ♂ 12.4-14.9, of ♀ 20.8-24.3;* of tegmen ♂ 1.6-2.0, ♀ 3.1-4.3 mm. —Southern Turkmenia: environs of Bezmein railroad station, Mollakara, Ashkhabad, Tedzhen; northeastern Iran: northern Khorasan. . . . . *3c. D. varentzovi salsolae Mistsh.

Mishchenko, 1950b:208, 210, Figure c.—varentzowi Umnov, 1931, Wien. Ent. Zeitg., XLVII:189, 203 (partim).

f (a). *Vertex in the ♂ short; its length from fastigium to the anterior* margin of the eye equal to its greatest width; fastigium nearly triangular (Figure 258). Ovipositor in the ♀ with a long slender *distal cusp on the ventral valves* (Figure 260). Length of ♂ *12.0-* 14.5, of ♀ 19.4-25.1; of tegmen in the ♂ 2.1-2.3, ♀ 4.1-5.2 mm. — Southeastern Turkmenia: Ishkak in the Kerkin region. . . . . *3d. D. varentzovi affinis *Mistsh.*

Mishchenko, 1950b:208, 211, Figure f, g.—varentzowi Umnov, 1931, Wien. Ent. Zeitg., XLVII:189, 203 (partim).

6 (1). Tegmina always contiguous or overlapping at the base.
7 (12). Tegmina in both sexes strongly abbreviated, *sometimes in the* ♀ well developed but in spite of this far from reaching the distal end of the posterior
8 (9). Fastigium in the ♂ wide and rounded (Figure 261). *Pronotum* in the ♀ with a long anterior part; length of anterior part nearly twice more than the greatest length of the posterior part of the pronotum. Length of ♂ 11.9-16.2, ♀ 19.5-22.2 mm; of tegmina ♂ 2.2-2.8, ♀ 4.8-6.3 mm. —Southwestern Tadzhikistan: Aivadzh, Dzhilikul;

northern Afghanistan Kazan . . . *4. D. gussakovskii Mir.

—gussakovskyi Miram, 1949, Trudy Zoologicheskogo instituta AN SSSR, VIII:717, Figures 1-3, Mishchenko, 1950b:208, 211, Figure h.

9 (8). Fastigium in the ♂ narrow, nearly triangular (Figure 262). Pronotum in the ♀ with a wide anterior part; length of anterior part 1.5 times greater than the greatest length of the posterior part of the pronotum.

10(11). Pronotum in the ♀ flat in profile, not swollen in the posterior part.
158 Tegmina in the ♀ greatly abbreviated, hardly extending beyond the base of the hind femora. ♂ unknown. Length of ♀ 18.8, of tegmen 4.2 mm. —Southern Kazakhstan· Kzyl-Orda . . . . *5. D. bellus Mistsh.

Mishchenko, 1950b 208, 211, Figure j

11(10). Fastigium narrow in the ♂, nearly triangular (Figure 262). Pronotum in the ♀ saddle-shaped in profile, swollen in the posterior part. Tegmina in the ♀ well developed, extending beyond the middle of the hind femora Length of body of ♂ 11.8-12.5, of ♀ 18.1-22.0 mm, of tegmina ♂ 2.0-2.2, ♀ 9.2-12.2 mm. —Kara-Kalpakia· Khiva, Rabat . . . . *6. D. chivensis Um.

Umnov, 1931, Wien. Ent. Zeitg., XLVII 193, 204 Mishchenko, 1950b.208, 212, Figure i.

12 (7). Tegmina in both sexes well developed, in the ♀ extending slightly beyond the distal end of the hind femora Length of the ♂ 12 3-13.5, ♀ 19.3 mm; of tegmina ♂ 7-8, ♀ 12.5 mm. —Uzbekistan, foothills of the Chatkal Range . . *7. D. ferghanensis Um.

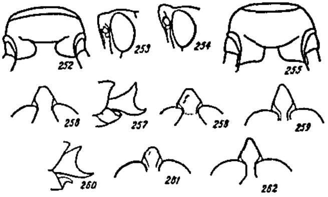
Umnov, 1931, Wien. Ent. Zeitg., XLVII 198, 204 Mishchenko, 1950b·208, 212.

6. Genus Iranella Uv.

Uvarov, 1922, Journ. Bomb. Nat. Hist. Soc., XXVIII 361.
Type of genus Iranella eremiaphila Uv

Body flattened, thickset. Head small, considerably shorter than the pronotum. No foveolae Pronotum with a low median carina Tegmina wide; 2.5 to 3 times longer than its greatest width Wings "sectored". Inferior genicular lobe of hind femur rounded off, without a spine. Hind tibiae dorsally with external and internal distal spines and 8-10 spines on the outer margin, sometimes the external spine is absent, spines in the lower part of tibia short, weakly projecting outward. Prosternal process wide, wedge-shaped, usually with an apical notch. Mesosternal lobes not contiguous, narrowest part of space between them 2.25-3 times greater than its length. Metasternum wide, its greatest width distinctly greater than

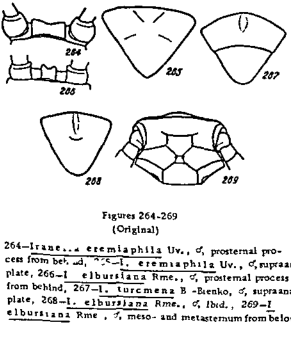
Figure 251. Bufonacridella sumakovi Ad., ♂. (Original)



Figures 252-262
(Original)

252—Diexis uvarovi Tarb., ♀, mesosternum from below; 253—D. bucharicus Mistsh., ♀, head from the side, 254—D. uvarovi Tarb., ♀, ibid.; 255—D. varentzovi affinis Mistsh., ♀, mesosternum from below, 256—D. varentzovi salsolae Mistsh., ♂, vertex from above; 257—D varentzovi probus Mistsh., ♀, ovipositor from the side, 258—D. varentzovi affinis Mistsh., ♂, vertex from above, 259—D. varentzovi varentzovi Zub , ♂, ibid., 260—D. varentzovi affinis Mistsh., ♀, ovipositor from the side, 261—D. gussakovskii Mir., ♂, vertex from above, 262—D. chivensis Um., ♂, ibid.

Figure 263. Diexis varentzovi varentzovi Zub , ♀. (Original)



Figures 264-269
(Original)

264—Irane...a eremiaphila Uv., ♂, prosternal process from beh..d, 265—I. eremiaphila Uv., ♂, supraanal plate, 266—I elbursiana Rme., ♂, prosternal process from behind, 267—I. turcmena B -Bienko, ♂, supraanal plate, 268—I. elbursiana Rme., ♂, ibid., 269—I elbursiana Rme , ♂, meso- and metasternum from below.

the length of the meso- and metasternum combined. Ovipositor in the ♀ with dorsal valves narrowed toward the tip, they are nearly equal to the ventral valves, dorsal outer margin of dorsal valves entire, without median incision

Four species are known, in southern Turkmenia, in Iran, and in Afghanistan.

1(2) Pronotum in both sexes with an effaced median carina in the anterior part. Hind tibiae in both sexes without an external distal spine dorsally. Prosternal process in both sexes wide, its narrowest part 1.5 times greater than the greatest width of the coxa of the front legs (Figure 264). Supraanal plate in the ♂ wide, its greatest width distinctly greater than its length (Figure 265). Frontal ridge in the ♀ above the median ocellus flat, having coarse punctures. Length of ♂ 15.0-22.2, ♀ 21.4-30.7 mm; of tegmina in the ♂ 9.5-15.1, ♀ 11.5-17.4 mm. —Iran, Afghanistan. . . . . 1. I. eremiaphila Uv.

Uvarov, 1922, Journ. Bomb. Nat. Hist. Soc., XXVIII: 362.

59 2(1). Pronotum in both sexes with a distinct median carina in the anterior part. Hind tibiae in both sexes usually with an external distal spine on the dorsal aspect. Prosternal process in both sexes narrower; its narrowest part less than, equal to, or even greater than the greatest width of the coxa of the front legs (Figures 104, 266) Supraanal plate in the ♂ narrower, its greatest width equal to or less than its length (Figures 267, 268).

3(4). Pronotum in the ♂ without lateral carinas in the posterior part. Prosternal process in the ♂ moderately wide, its narrowest part greater than the greatest width of the coxa of the front legs, straight on the distal end, without a median incision (Figure 104). Metasternum in the ♂ with a wide space between the lobes, its narrowest part 1.5 times greater than its length (Figure 121). Supraanal plate in the ♂ rather wide; its greatest width equal to its length (Figure 267). ♀ unknown. Length of the ♂ 18.3-18.7, of tegmina 9.4-10.6 mm. —Southern Turkmenia Akhcha-kuima. . . . . *2. I. turcmena B.-Bienko

—eremiaphila turcmena Bei-Bienko, 1948, Zapiski Leningradskogo sel'skokhozyaistvennogo instituta, 5 146.

4(3). Pronotum in both sexes with distinct lateral carinas in the posterior part. Prosternal process in both sexes narrow; its narrowest part less than or equal to the greatest width of coxa forelegs, with a distinct median triangular notch (Figure 266) on the distal end. Metasternum of both sexes with a narrower space between the lobes, its narrowest part is equal to its length (Figure 269). Supraanal plate in the ♂ narrow, its greatest width less than its length (Figure 268). Length
160 of the ♂ 16.7-18.2, ♀ 21.8-24.6 mm, of tegmina ♂ 10.8-13.0, ♀ 10.7-14.5 mm. —Iran southern Gorgan, Kerman. . . . . 3. I. elbursiana Rme.

Ramme, 1929, Eos, V:156, Figures 7a, 8, tab. V, Figures 3, 3b-c.

7. Genus Spathosternum Kr.

Krauss, 1877, Sitz. Akad. Wissen. Wien, Math.-nat. Kl., Abt. I, LXXVI: 44, Kirby, 1914:191, 207; Tinkham, 1940:286.—Gymnobothrus Kirby, 1914:96, 113 (partim).

Type of genus- Spathosternum nigrotaeniatum (Stal), West Africa.

Body well-shaped. Head short; considerably shorter than the pronotum. Foveolae indistinct. Antennae short, not reaching the posterior margin of the pronotum. Pronotum with a low median carina and with sharp lateral carinas; its transverse grooves colorless. Tegmina narrow, distinctly narrowed toward the apex. Length of tegmen 5.0-6.5 times greater than its greatest width. Wings elongate-triangular. Hind femora with a rounded ventral genicular lobe, the lobe without a spine. Hind tibiae dorsally with external and internal distal spines and with 10-11 spines on the outer dorsal margin; spines in the ventral [or lower] part of the tibia short, weakly projecting outward. Prosternal process wide, wedge-shaped, flattened, widthwise with an incision at the apex. Mesosternal lobes not contiguous; narrowest part of space between them a half its length. Metathorax narrow; its greatest width 2/3 the length of meso- and metasternum combined. Ovipositor in the ♀ with the dorsal valves narrowed toward the tip, they are nearly equal to the ventral valves; dorsal outer margin of the dorsal valves entire, without a median incision.

About 7 species, distributed in Africa, Kashmir, India, and southeastern Asia, are known.

1 (1). Eyes large; vertical diameter of eye in the ♂ nearly 4 times, in the ♀ nearly 3 times greater than the length of the subocular grooves. Vertex wide; its width between the eyes 1.5 times greater than the width of the frontal ridge between the antennae. Hind femora well-shaped; length of femur in the ♂ 5 times, in the ♀ 4 times greater than the greatest width . . . . . . 1. S. prasiniferum (Walk.)

a(b). Tegmina and wings well developed; tegmina reaching or extending slightly beyond the distal end of the hind femora. Length of ♂ 12.5-17.1, ♀ 16.4-23.0 mm; of tegmina ♂ 10.0-12.5, ♀ 11.5-15.0 mm. — Kashmir, India, Indo-China, China: Kwangsi, Yunnan, Kwantung . . . . 1a. S. prasiniferum prasiniferum (Walk.)

Tinkham, 1940:286.—prasinifera Walker, 1871, Cat. Derm. Salt. Brit. Mus. Suppl., V:65 (? Heteracris).—caliginosus Walker, 1871, ibid.:69 (Caloptenus).—strigulatus Walker, 1871, ibid.: 82 (Stenobothrus).—simplex Walker, 1871, ibid.:82 (Stenobothrus), Kirby, 1914:114 (? Gymnobothrus).—rectus Walker, 1871, ibid.:83 (Stenobothrus).—prasiniferum Kirby, 1914:208, Figure 121.

b(a). Tegmina and wings strongly abbreviated; tegmina far from reaching the middle of the hind femurs. Length of ♂ 15.1-18.0, ♀ 18.2-23.2 mm; of tegmina ♂ 6.2-8.3, ♀ 7.2-10.0 mm. —China: Szechwan, Hupeh, Kwangtung, Hainan Island, Kwangsi . . . . 1b. S. prasiniferum sinense Uv.

Tinkham, 1940:287, tab. XIII, Figures 9, 9a.—sinense Uvarov, 1931, Lingn. Sci. Journ., X, 2-3:220.

8. Genus Miramia Uv.

Uvarov, 1933, Trudy Zoologicheskogo Instituta AN SSSR, (1932), I 224.

Body slender. Head short; considerably shorter than the pronotum. No foveolae. Antennae rather long, reaching or extending beyond the posterior margin of the pronotum. Pronotum with a low median carina, without lateral carinae, and with 4 black transverse grooves. Tegmina narrow, distinctly narrowed toward the apex. Wings elongate-triangular. Hind femora with rounded ventral genicular lobe, the lobe without spines. Hind tibiae on the dorsal aspect with external and internal distal spines and with 8-9 spines on the outer dorsal margin, spines in the lower part of tibia short, slightly projecting outwards. Prosternal process wide, wedge-shaped, flattened widthwise, with a distinct triangular incision on the apex. Mesosternal lobes distinctly separated, the space between them narrow, its narrowest part 1/6 to 1/5 its length Metasternum narrow, its greatest width 2/3 the length of the meso- and metasternum together. Ovipositor in the ♀ with tapered dorsal valves which are almost similar to the ventral valves, dorsal outer margin of dorsal valves entire, without a median notch.

Only one species, from southeastern Iran, is known.

1(1). Vertex moderately wide, its width between the eyes 1.5 times greater than the width of the frontal ridge between the antennae Eyes very large; vertical diameter of the eye nearly twice the horizontal diameter. Inner and ventral aspects of the hind femora red. Hind tibiae blue, with a narrow black ring at the base. ♂ cerci conical, weakly bent inward ♀ subgenital plate with 3 lobes on the posterior margin, the median lobe considerably longer than the lateral lobes and with 2 oblique black lateral carinae Length of ♂ 38 0-46.4, ♀ 47.0-56.6 mm, of tegmen in the ♂ 29.0-31.5, ♀ 34.0-37.5 mm —Iran Laristan (!), Kerman . . . . 1. M. perpolita Uv.

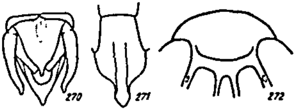
Uvarov, 1933, Trudy Zoologicheskogo Instituta AN SSSR, (1932), I 224.

9. Genus Hieroglyphus Kr.

Krauss, 1877, Sitz. Akad. Wissen. Wien, Math.-nat. Kl., Abt. I, LXXVI 41 I Bolivar, 1912:50, 53 Kirby, 1914:192, 201, I Bolivar, 1918 11, 28; Uvarov, 1922 226, 228 Tinkham, 1940 290, 298.

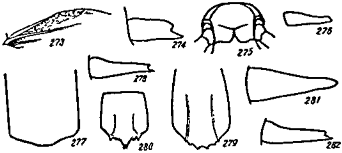
Type of genus Hieroglyphus daganensis Kr , West Africa

Body slender. Head short, considerably shorter than the pronotum. No foveolae or they are very indistinct Antennae long, extending beyond the posterior margin of the pronotum Pronotum with a low median carina, without lateral carinae and with 3 transverse black grooves Tegmina narrow, distinctly tapered, Wings elongate-triangular. Posterior femora with acute-angular ventral genicular lobes, the lobe without spines. Posterior tibiae dorsally with external and internal distal spines and with 7-10 spines on the outer dorsal margin, the spines in the lower part of the tibia short,



Figures 270-272
(Figures 270 and 271 according to Uvarov with alterations, Figure 272 original)

270—Hieroglyphus annulicornis (Shir.), ♂, tip of abdomen from above; 271—H. concolor (Walk.), ♀, subgenital plate; 272—H. annulicornis (Shir.), ♀, upper part of head, front view.



Figures 273-282
(Figures 276 and 280 according to Tsai, the rest original)

273—Oxya fuscovittata (Marsch.), ♀, basal part of anterior margin of right tegmen, 274—O. fuscovittata (Marsch.), ♂, left cercus from the side, 275—O. rufostriata Will., ♂, mesothorax from below, 276—O. agavisa Tsai, ♂, left cercus from the side, 277—O. fuscovittata (Marsch.), ♀, subgenital plate, 278—O. rufostriata Will., ♂, left cercus from the side; 279—O. rufostriata Will., ♀, subgenital plate, 280—O. agavisa Tsai, ♀, ibid.; 281—O. sinuosa Mistshenko sp. n., ♂, left cercus from the side (paratype), 282—O. nitidula (Walk.), ♂, ibid.

slightly projecting outward. Prosternal process conical, pointed. Mesosternal lobes distinctly separated, the space between them narrow, its
162 narrowest part 1/8 to 1/4 its length. Metasternum narrow, its greatest width 2/3 the length of the meso- and metasternum combined ♀ ovipositor with tapered dorsal vavles which are nearly equal to the ventral valves, outer dorsal margin of dorsal valves entire, without median notch.

Eight species, in Africa and in southeastern Asia, are known

1 (4). ♂ cerci slightly bent inward, narrowed toward a pointed apex (Figure 270) ♀ subgenital plate with 2 rough longitudinal raised carinae (Figure 271).

2 (3) Lateral margins of fastigium in both sexes, wide, punctate, with indistinct vertexal pits. Pronotum in both sexes coarsely punctate. Tegmina in both sexes without spurious median vein [vena spuria] in the median field. ♂ cerci hardly extending beyond the distal end of the supraanal plate and not reaching the distal end of the subgenital plate. ♂ subgenital plate bluntly conical, its length equal to its width at the base, in the ♀ with distinctly dentate lateral carinae (Figure 271). Length of ♂ 30-45, ♀ 46-60 mm, of tegmen in the ♂ 22-32, ♀ 33-45 mm. — North and southwestern India, Himalayas, Sikkim, Burma, China. (According to Uvarov) . . . . 1. H. concolor (Walk.)

Walker, 1870, Cat. Derm. Salt. Brit. Mus., IV 646 (Oxya) I. Bolivar, 1912.54, Kirby, 1914:202, 205, Uvarov, 1922:231, 233, Figure 2A. —tarsalis Stål, 1878, Bih. Sven. Akad. Handl., V, 4:48, 93. —citrinolimbatus Brunner-Wattenwyl, 1893, Ann. Mus. Civ. Stor. Nat. Genova, (2), XIII (XXXIII):154 I. Bolivar, 1912:54 Kirby, 1914:202, 205.

3 (2). Lateral margins of fastigium in both sexes narrow, hardly punctate, not depressed (Figure 272) Pronotum in both sexes less coarsely punctate. Tegmina in both sexes with a distinct median spurious vein in the median field. ♂ cerci distinctly extending beyond the distal end of the supraanal plate and sometimes reaching the distal end of the subgenital plate (Figure 270). ♂ subgenital plate with distinctly produced distal end, in the ♀ with granular lateral carinae Length of ♂ 35-42, ♀ 49-65 mm, of ♂ tegmen 25-30, ♀ 34-41 mm —India, Viet Nam, China Szechwan, Hupeh, Kwangsi, Kwantung, Hainan Island, Taiwan. —In China it is a pest of rice, sugar cane, bamboo, Canna indica and garden plants (According to Uvarov and Tinkham) . . . . 2. M. annulicornis (Shir.)

Shiraki, 1910 53, 57, tab. II, Figures 12a-c (Oxya), Matsumura, 1911, Mem. Soc. Ent. Belgique, XVIII 129 (Oxya) Uvarov, 1922:231, 234, Figures 1E, 1C, Tinkham 1940 298, 299. —formosanus I. Bolivar, 1912.54, 55.

163 4 (1). ♂ cerci gradually widened toward a bilobate distal end, dorsal lobe with a large blunt process, bent inward, near the apex, and the ventral lobe with a long ventrad-curved needle-shaped spur. ♀ subgenital plate without lateral longitudinal carinae Length of ♂ 37 mm, unknown in the ♀, of ♂ tegmen 26 mm, unknown in the ♀. —Viet Nam, China Hupeh, Fukien, Kwangsi, Kwantung, Hainan Island In China is a pest of rice, sugar cane, and bamboo. (According to I. Bolivar and Tinkham) . . . . 3. H. tonkinensis I Bol.

I. Bolivar, 1912.54 Uvarov, 1922 232, 239 Tinkham, 1940.298, 299, 300. Biology: Tinkham, 1936, Ling. Sci. Journ., XV, 2 210.

10. Genus Oxya Serv.

Serville, 1831, Ann. Sci. Nat., XXII:264, 286; Jakobson, 1905:172, 201, 301; Shiraki, 1910:51, 52; Kirby, 1914:192, 198, I. Bolivar, 1918:7, 14, Willemse, 1925:8, Uvarov, 1927a:167, 172.

Type of genus: Oxyla hyla Serv., Africa.

Head short; considerably shorter than the pronotum. No foveolae. Pronotum with a low median carina and colorless transverse grooves. Tegmina and wings well developed, rarely abbreviated but always overlapping one another on the dorsum. Hind femora with ventral genicular lobe produced into sharp spines on the distal ends. Hind tibiae in the distal part flatly widened, with sharply marked margins on the dorsal aspect; the latter with external and internal distal spines and with 6-9 spines along the outer margin, but with 9-11 on the inner margin; the spines of the outer margin project slightly outward but the spines of the inner margin are uniformly situated, the spaces between them nearly being equal to each other. Prosternal process straight, conical. Mesosternal lobes separated, not contiguous, the space between them narrow; its narrowest part usually 1/4 to 2/5 the narrowest part of the mesosternal lobe, very rarely in the ♂ it is 1/10 to 1/8 this width. Abdomen with well-developed tympanic organ on the first tergite. ♀ ovipositor with tapered dorsal valves which are nearly equal to the ventral valves; dorsal outer margin of dorsal valves entire, without median notch, only with denticles of different sizes.

About 37 species are known, living chiefly in southern Asia or on its islands, and also in Africa, Australia, and on the Hawaiian Islands.

1 (32). Tegmina and wings well developed, reaching or extending beyond the distal end of the hind femora.

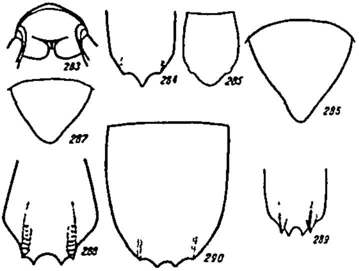
2 (7). ♀ tegmina with sharply dentate anterior margin (Figure 273). ♂ cerci either wide, slightly narrowed toward the apex, the length of a cercus 2. to 2.25 times larger than its greatest width (Figure 274); or the ♂ cerci are narrow, but then the mesosternal lobes are
164 either almost contiguous in the anterior part (Figure 275) or the cercus before the slightly produced apex is slightly but distinctly widened (Figure 276).

3 (4). ♂ cerci wide, weakly narrowed apicad, with 2 teeth on the apex the dorsal of which is rounded, and the ventral pointed; length of cercus 2 to 2.25 times more than the greatest width (Figure 274). Subgenital plate of the ♀ smooth; its posterior margin rounded (Figure 277). Length of ♂ 17.5-25.8, ♀ 24.3-38.5 mm; tegmina of ♂ 14.6-23.3, ♀ 19.5-28.1 mm. —Central Asia; northern Afghanistan, western Pakistan, India (?). Slightly injurious to rice, joughara [sorghum] and volatile oil plants in Middle Asia . . . . *1. O. fuscovittata (Marsch.)—Rice, 'young mare' grasshopper [Kobylka risovaya].

Marschall, 1836, Ann. Wien Mus. Naturgesch., I·211, tab. XVIII, Figure 3 (Gryllus), Willemse, 1925:11, 22, Figures 14-15, Uvarov, 1927a:172, Figure 219, Uvarov, 1927b:289.—turanica Uvarov, 1912, Trudy Russkogo entomologicheskogo obshchestva, XL:28, plate I, Figures 4-5.

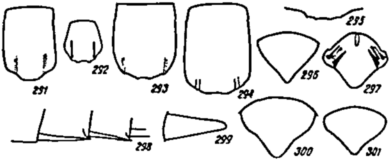
Biology: Bei-Bienko, 1932b:28, Predtechenskii, Zhdanov and Popova, 1935:133, Mishchenko, 1949b 164.

4 (3). ♂ cerci narrow, strongly narrowed toward the apex and either with 2 pointed teeth on the apex (Figure 278) or weakly widened in



Figures 283-290
(Figures 285 and 287 according to Willemse, Figure 287 with alterations, the rest original)

283—Oxya nitidula (Walk.), ♂, mesothorax from below, 284—O. nitidula (Walk.), ♀, genital plate, 285—O. bidentata Will., ♀, ibid., 286—O. nitidula (Walk.), ♂, supraanal plate, 287—O. bidentata Will., ♂, ibid.; 288-O. velox Fabr., ♀, subgenital plate; 289—O. chinensis (Thunb.), ♀, ibid., 290—O sinuosa Mistshenko sp. n., ♀, ibid. (paratype).



Figures 291-301
(Figure 292 according to Willemse, Figure 295 according to Furukawa, the rest original)

291—Oxya intricata (Stål), ♀, subgenital plate, 292—O. shanghaiensis Will., ♀, ibid., 293—O. maritima Mistshenko sp. n., ♀, ibid. (allotype) 294—O. manzhurica B-Bienko, ♀, ibid., 295—O. nakaii Furuk., ♀, posterior margin of subgenital plate, 296—O. chinensis (Thunb.), ♂, supraanal plate, 297—O. velox (Fabr.), ♂, ibid., 298—O. chinensis (Thunb.), ♀, first abdominal tergites from the side, 299—O. chinensis (Thunb.), ♂, left cercus from the side, 300—O. sinuosa Mistshenko sp. n., ♂, supraanal plate (type), 301—O. maritima Mistshenko sp n., ♂, ibid. (type).

front of the apex (Figure 276); cercus 3 times longer than its greatest width. ♀ subgenital plate with 2 lateral pads and 4-8 small teeth on the posterior margin (Figures 279, 280).

5 (6). ♂ cerci with 2 teeth on the apex (Figure 278). Subgenital plate in the ♀ long; its length 1.5 times more than its greatest width; its posterior margin with a wide semicircular notch in the middle; lateral areas nearly straight (Figure 279). Length of ♂ 18.1-19.2, ♀ 26.0-29.6 mm; tegmen ♂ 16.2-17.4, ♀ 24.0-27.5 mm. —Afghanistan (!), "Anterior India" [= German Vordere Indien which is either India proper or Hindustan]. . 2. O. rufostriata Will.

Willemse, 1925:12, 33, Figure 31.

165 6 (5). ♂ cerci weakly widened in front of the apex, with apex weakly produced (Figure 276). Subgenital plate in the ♀ short, nearly quadrate; its posterior margin with a median triangular process with 2 teeth on its apex; lateral areas arcuately curved (Figure 280). Length of ♂ 25, ♀ 30-35 mm; tegmen ♂ 28.5, ♀ 20-21 mm. —China: Szechwan, Hupeh, Chekiang, Kweichow, Kiangsi, Fukien, and Kwantung. Slightly injurious to rice in China. (According to Tsai) . . . . 3. O. agavisa Tsai.

Tsai, 1931, Mitt. Zool. Mus. Berlin, XVII:437, Figure 1.—agavisa f. robusta Tsai, 1931, ibid.:XVII: 439, Tinkham, 1940:292, 296.

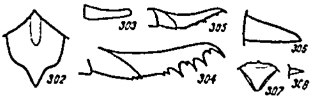
7 (2). Tegmina usually with a smooth anterior margin in the ♀. ♂ cerci narrow; length of a cercus 3 to 3.5 times more than its greatest width; usually conical (Figure 281) or with 2 teeth on the apex (Figure 282), then the lobes of the mesosternum are distinctly separated (Figure 283).

8 (11). ♂ cerci with 2 pointed teeth on the apex (Figure 282). Subgenital plate in the ♀ with a distinct median triangular process on the posterior margin and either with 2 lateral teeth (Figure 284) or with 2 lateral rounded processes (Figure 285).

9 (10). Supraanal plate of the ♂ with a median longitudinal depression, elongate triangular; considerably longer than its greatest width (Figure 286). ♀ subgenital plate with 2 lateral raised pads in the apical
166 part; its posterior median process narrow, pointed; lateral processes of posterior margin pointed (Figure 284). Length of ♂ 16.8-22.1, ♀ 22.0-30.1 mm; tegmen ♂ 16.2-18.5, ♀ 17.5-23.4 mm. —Southeastern Iran, India, Ceylon. . 4. O. nitidula (Walk.)

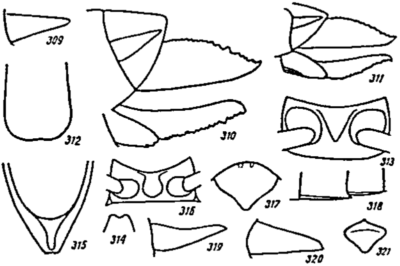
Uvarov, 1926, Bull. Ent. Res., XVII:47.—nitidulum Walker, 1870, Cat. Derm. Salt. Brit. Mus., IV:631 (Acridium).—tridentata Willemse, 1925:12, 30, Figure 27.

10 (9). Supraanal plate of ♂ smooth, short-triangular; distinctly shorter than its greatest width (Figure 287). ♀ subgenital plate smooth, its posterior median process wide, slightly rounded; lateral processes of posterior margin rounded (Figure 285). Length of ♂ 21.5, ♀ 21-27 mm; tegmen ♂ 20, ♀ 20-25 mm. —Western Pakistan, India,



Figures 302-308
(Figures 303, 305, 307, and 308 according to Tsai, the last three with alterations, the rest original)

302—Oxya intricata (Stål), ♂, supraanal plate; 303—O. rammei Tsai, ♂, left cercus from the side, 304—O. intricata (Stål), ♀, left ventral valve of ovipositor from the side, 305—O. rammei Tsai, ♀, ibid.; 306—O. intricata (Stål), ♂, left cercus from one side, 307—O. rammei Tsai, ♂, supraanal plate; 308—O rammei Tsai, ♀, left cercus from the side.



Figures 309-321
(Figures 311 and 317 according to Willemse, Figure 317 with alterations, Figure 321 according to Furukawa with alterations, the rest original)

309—Oxya maritima Mistshenko sp. n., ♂, left cercus from the side (type), 310—O maritima Mistshenko sp. n, ♀, ovipositor from the side (allotype), 311—O shanghaiensis Will., ♀, ibid., 312—O. adentata Will., ♀, subgenital plate, 313—O. maritima Mistshenko sp. n., ♀, prothorax, front view (allotype), 314—O. maritima Mistshenko sp. n, ♂, apex of subgenital plate from below (type) 315—O. maritima Mistshenko sp. n, ♂, subgenital plate from above (type), 316—O. manzhurica B.-Bienko, ♀, prothorax, front view, 317—O adentata Will., ♂, supraanal plate, 318—O. manzhurica B.-Bienko, ♀, first abdominal tergite from the side, 319—O. manzhurica B.-Bienko, ♂, left cercus from the side, 320—O. adentata Will., ♂, ibid., 321—O. nakaii Furuk., ♂, supraanal plate

front of the apex (Figure 276); cercus 3 times longer than its greatest width. ♀ subgenital plate with 2 lateral pads and 4-8 small teeth on the posterior margin (Figures 279, 280).

5 (6). ♂ cerci with 2 teeth on the apex (Figure 278). Subgenital plate in the ♀ long; its length 1.5 times more than its greatest width; its posterior margin with a wide semicircular notch in the middle; lateral areas nearly straight (Figure 279). Length of ♂ 18.1-19.2, ♀ 26.0-29.6 mm; tegmen ♂ 16.2-17.4, ♀ 24.0-27.5 mm. —Afghanistan (!), "Anterior India" [= German Vordere Indien which is either India proper or Hindustan]. . 2. O. rufostriata Will.

Willemse, 1925:12, 33, Figure 31.

165 6 (5). ♂ cerci weakly widened in front of the apex, with apex weakly produced (Figure 276). Subgenital plate in the ♀ short, nearly quadrate; its posterior margin with a median triangular process with 2 teeth on its apex; lateral areas arcuately curved (Figure 280). Length of ♂ 25, ♀ 30-35 mm; tegmen ♂ 28.5, ♀ 20-21 mm. —China: Szechwan, Hupeh, Chekiang, Kweichow, Kiangsi, Fukien, and Kwantung. Slightly injurious to rice in China. (According to Tsai) . . . . 3. O. agavisa Tsai.

Tsai, 1931, Mitt. Zool. Mus. Berlin, XVII.437, Figure 1.—agavisa f. robusta Tsai, 1931, ibid.:XVII: 439, Tinkham, 1940.292, 296.

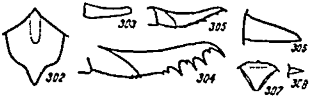
7 (2). Tegmina usually with a smooth anterior margin in the ♀. ♂ cerci narrow; length of a cercus 3 to 3.5 times more than its greatest width; usually conical (Figure 281) or with 2 teeth on the apex (Figure 282), then the lobes of the mesosternum are distinctly separated (Figure 283).

8 (11). ♂ cerci with 2 pointed teeth on the apex (Figure 282). Subgenital plate in the ♀ with a distinct median triangular process on the posterior margin and either with 2 lateral teeth (Figure 284) or with 2 lateral rounded processes (Figure 285).

9 (10). Supraanal plate of the ♂ with a median longitudinal depression, elongate triangular; considerably longer than its greatest width (Fig-
166 ure 286). ♀ subgenital plate with 2 lateral raised pads in the apical part; its posterior median process narrow, pointed; lateral processes of posterior margin pointed (Figure 284). Length of ♂ 16.8-22.1, ♀ 22.0-30.1 mm; tegmen ♂ 16.2-18.5, ♀ 17.5-23.4 mm. —Southeastern Iran, India, Ceylon. . 4. O. nitidula (Walk.)

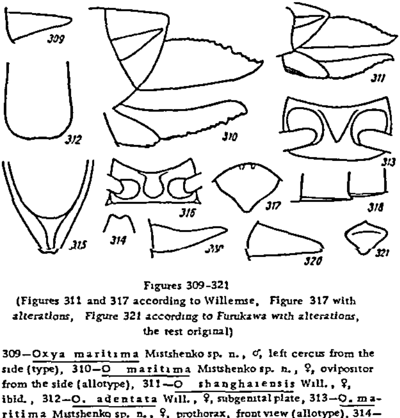
Uvarov, 1926, Bull. Ent. Res., XVII.47.—nitidulum Walker, 1870, Cat. Derm. Salt. Brit. Mus., IV.631 (Acridium).—tridentata Willemse, 1925:12, 30, Figure 27.

10 (9). Supraanal plate of ♂ smooth, short-triangular; distinctly shorter than its greatest width (Figure 287). ♀ subgenital plate smooth, its posterior median process wide, slightly rounded; lateral processes of posterior margin rounded (Figure 285). Length of ♂ 21.5, ♀ 21-27 mm; tegmen ♂ 20, ♀ 20-25 mm. —Western Pakistan, India,



Figures 302-308
(Figures 303, 305, 307, and 308 according to Tsai, the last three with alterations, the rest original)

302—Oxya intricata (Stål), ♂, supraanal plate, 303—O. rammei Tsai, ♂, left cercus from the side, 304—O. intricata (Stål), ♀, left ventral valve of ovipositor from the side, 305—O. rammei Tsai, ♀, ibid., 306—O. intricata (Stål), ♂, left cercus from one side; 307—O. rammei Tsai, ♂, supraanal plate; 308—O rammei Tsai, ♀, left cercus from the side.



Figures 309-321
(Figures 311 and 317 according to Willemse, Figure 317 with alterations, Figure 321 according to Furukawa with alterations, the rest original)

309—Oxya maritima Mistshenko sp. n., ♂, left cercus from the side (type), 310—O maritima Mistshenko sp. n., ♀, ovipositor from the side (allotype), 311—O shanghaiensis Will., ♀, ibid., 312—O. adentata Will., ♀, subgenital plate, 313—O. maritima Mistshenko sp. n., ♀, prothorax, front view (allotype), 314—O. maritima Mistshenko sp. n., ♂, apex of subgenital plate from below (type), 315—O. maritima Mistshenko sp. n., ♂, subgenital plate from above (type), 316—O. manzhurica B.-Bienko, ♀, prothorax, front view, 317—O. adentata Will., ♂, supraanal plate, 318—O. manzhurica B.-Bienko, ♀, first abdominal tergite from the side, 319—O. manzhurica B.-Bienko, ♂, left cercus from the side, 320—O. adentata Will., ♂, ibid., 321—O. nakaii Furuk., ♂, supraanal plate

China: Szechwan, Chekiang, Kiangsi (According to Willemse). . . . . 5. <u>O. bidentata</u> Will.

Willemse, 1925:11, 24, Figures 16, 17, Uvarov, 1926, Bull. Ent. Res., XVII:47; Tinkham, 1940:292, 293. —<u>nitidula</u> Willemse, 1925:12, 29, Figure 26 (not Walker).

11 (8). ♂ cerci conical, pointed (Figure 281). ♀ subgenital plate with only 2-4 lateral teeth on the posterior margin or without them altogether; median triangular process on the posterior margin absent (Figures 288-295).

12 (17). ♂ antennae long and slender, the length of a separate median segment of the antenna 2 to 2.5 times more than its greatest width; sometimes 1.5 times more than that, then the supraanal plate is short, its length equal to or less than its greatest width with distinctly narrowed produced apical half (Figure 296). ♀ subgenital plate with sharp teeth, moreover either they are all situated on its posterior
167 margin (Figure 289) or the 2 median teeth are situated on its posterior margin and the 2 most lateral teeth somewhat withdrawn from it (Figure 288).

13 (14). ♂ supraanal plate with distinct pads near the lateral margins, around which its surface is strongly depressed (Figure 297). ♀ subgenital plate with at least 4 teeth, but the 2 middle ones are situated along its posterior margin and the 2 most lateral ones are somewhat withdrawn from it (Figure 288). Second abdominal tergite in the ♀ usually with a distinct spine at the posterior ventral angle. Length of ♂ 27-32, ♀ 27-35 mm; tegmen ♂ 23.5 – 25.0, ♀ 26.0-30.5 mm. —India, Viet Nam, southeastern China, Taiwan, Korea (?), Japan, Reported as a pest of rice in Korea . . . . 6. <u>O. velox</u> (Fabr.)

Fabricius, 1787, Mantiss. Insector., I:239 (<u>Gryllus</u>); Jakobson, 1905:201, 301 (partim); Shiraki, 1910: 52, 53 (partim), Kirby, 1914:198, 199 (partim); Willemse, 1925:13, 52, Figures 58, 59; Tinkham, 1940.292, 296. —<u>vicina</u> Brunner-Wattenwyl, 1893, Ann. Mus. Civ. Stor. Nat. Genova, (2), XIII (XXXIII):152 (partly); Jakobson, 1905:201, 301 (partim); Kirby, 1914.198, 199 (partim).

Biology: Bei-Bienko, 1932b·28.

14 (13). ♂ supraanal plate flat without pads near the lateral margins (Figure 296). ♀ subgenital plate with 4 teeth along the posterior margin (Figures 289, 290).

15 (16). Second and sometimes the third abdominal tergite in the ♀ with a distinct spine at the postero-ventral angle (Figure 298). Supraanal plate of ♂ with a narrow pointed apex (Figure 296). ♂ cerci conical, with straight lateral margins (Figure 299). ♀ subgenital plate with long lateral raised carinae reaching its middle (Figure 289). Length of ♂ 18.3-22.6, ♀ 24.0-33.4 mm; tegmina ♂ 14.3-19.5, ♀ 16.0-27.3 mm. —Island of St. Mauritius, southeastern Asia with islands, Philippine and Hawaiian Islands, New Pomerania, Australia. Very injurious to cultivated plants in the Hawaiian Islands . . . . 7. <u>O. chinensis</u> (Thunb.)

Thunberg, 1815, Mem. Acad. Sci. St.-Petersb., (5), V:253 (Gryllus), Uvarov, 1926, Bull. Ent. Res., XVII 48, Tinkham, 1940-292, 295.—sinense Walker, 1870, Cat. Derm. Salt. Brit. Mus., IV-628 (Acridium).—lobata Stål, 1877, Ofvers. K. Vet.-Akad. Forh., 10:53 —velox Jakobson, 1905:201, 301 (partim), Shiraki, 1910:52, 53 (partim), Kirby, 1914:198, 199 (partim).—sinensis Willemse, 1925 13, 49, Figures 54-57.

Biology: Swezey, 1926, Hawaii. Planters Rec., XXX, 3:378-381, Liu and Li, 1932, Yearb. Chin. Bur. Ent. Hangchow:59-70.

16 (15). Second and third abdominal tergites in the ♀ usually without a spine, sometimes the second tergite has a very short indistinct spine. Supraanal plate in the ♂ with a wide rounded apex (Figure 300). ♂ cerci conical, distinctly compressed in front of the apex (Figure 281). ♀ subgenital plate with short lateral raised carinae, not reaching its middle by far (Figure 290). Length of ♂ 21.5-27.5, ♀ 28.6-35.7 mm, tegmina ♂ 15.6-21.2, ♀ 20.8-24.5 mm. —Korea, region of Seoul. To all appearances reports on finding O. velox (Fabr.) in Korea refer to this species. . . . . 8 O sinuosa Mistshenko sp. n.

17 (12). ♂ antennae shorter and stouter, length of the separate median segment of the antenna 1.25-1.5 times more than its greatest width ♂ supraanal plate usually with apex not produced (Figure 307), sometimes its apex is distinctly produced and then its length is distinctly
168 greater than its greatest width (Figure 302). ♀ subgenital plate with 2, rarely with 4 distinctly expressed teeth on the posterior margin or entirely without them (Figures 291-295).

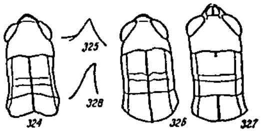
18 (21). ♂ cerci either constricted in the middle, widened toward base and apex (Figure 303), or conical but then the supraanal plate is elongate-triangular, its length considerably greater than its greatest width (Figure 302). ♀ ovipositor with irregularly developed pointed teeth on the ventro-external margin of the ventral valve, some long, the others short (Figures 304-305).

19 (20). ♂ supraanal plateelongate-triangular with apical fourth distinctly produced, its length clearly greater than its greatest width (Figure 302). Cerci in both sexes conical with pointed apex, in the ♀ reaching the apex of the supraanal plate, length of cercus 3-3.25 times greater than the greatest width (Figure 306). ♀ ovipositor with slender irregularly developed teeth on the ventro-external margin of the ventral valve, tooth at tip distinctly separate, spaces between the long teeth of the apical half either with one small tooth or smooth without small teeth (Figure 304). Length ♂ 17.5-17.8, ♀ 23.5-29.0 mm, tegmina ♂ 13.5-16.0, ♀ 18.5-27.5 mm. —India, Ceylon, Malacca peninsula, islands of the Malay Archipelago, central and south China, islands of Hainan, Taiwan, Japan, Philippines, Moluccas, and Carolines. Very injurious to rice in China . . . . . . 9 O. intricata (Stål)

Kirby, 1914:200 Willemse, 1925 57, Figure 64, Uvarov, 1926, Bull Ent Res , XVII 45, Tinkham, 1940-292, 294 —intricatum Stål, 1860, Kongl Freg Eug Resa, Zool , V, Orth 335 (Acridium (Oxya)) —universalis Willemse, 1925 11, 21, Figures 12-13 —insularis Willemse, 1925 12, 34, Figures 32-33

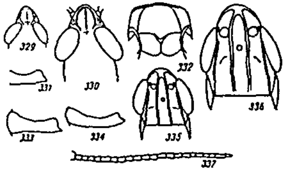
20 (19) ♂ supraanal plate short-triangular, its length distinctly less than its greatest width (Figure 307) ♂ cerci medially constricted, widened toward base and apex, with a rounded apex, length of cerci nearly 4 times greater than their greatest width (Figure 303), in the ♀ the

Figures 322, 323. Subgenital plate in ♀. (According to Willemse)



Figures 324-328
(According to Chang)

324—Caryanda methiola Chang, ♀, head and pronotum from above, 325—C. methiola Chang, ♀, prosternal process from the side; 326—C. sinensis Chang, ♀, head and pronotum from above; 327—C. omeiensis Chang, ♀, ibid.; 328—C. sinensis Chang, ♀, prosternal process from the side.



(Figures 329 and 331 according to Uvarov, the rest original)

329—Tropidopola daurica Uv., ♂, head from above, 330—T. cylindrica obtusa Uv., ♂, ibid., 331—T. daurica Uv., ♂, left cercus from the side, 332—T. cylindrica obtusa Uv., ♂, mesosternum from below, 333—T. cylindrica obtusa Uv., ♂, left cercus from the side, 334—T. cylindrica iranica Uv., ♂, ibid. 335—T. cylindrica obtusa Uv., ♂, head, front view, 336—T. cylindrica obtusa Uv., ♀, ibid., 337—T. cylindrica obtusa Uv., ♀, right antenna from above.

cerci are short, conical, with a pointed apex, far from reaching
69 the apex of the supraanal plate, length of cercus 2.2 times greater than its greatest width (Figure 308). ♀ ovipositor with wide irregularly developed teeth on the ventro-external margin of the ventral valve; all spaces between the long teeth in the apical half with 2-3 small teeth (Figure 305). Length of ♂ 28, ♀ 26.5-31.5 mm; tegmina ♂ 26, ♀ 21.3-25.0 mm. —China Szechwan (!), Kwantung. (♂ according to Tsai). . . . . 10. O. rammei Tsai.

Tsai, 1931, Mitt. Zool. Mus. Berlin, XVII:439, Figure 2.

21(18). ♂ cerci conical (Figure 309). ♂ supraanal plate short-triangular, its length considerably less than its greatest width (Figure 300). ♀ ovipositor with uniformly developed blunt or blunted teeth on the ventro-external margin of the ventral valve, teeth of almost equal length (Figure 310).

22(23). Cerci of ♀ long and narrow, length of cercus 3 times greater than its greatest width (Figure 311). ♀ subgenital plate strongly widened beyond the middle and sharply narrowed toward base and apex, with 2 sharp lateral carinae reaching the middle (Figure 292). ♀ ovipositor with clearly expressed apical tooth on the ventral valve (Figure 311). ♂ unknown. Length of ♀ 34 mm, tegmina 33 mm. (According to Willemse). —China Kansu, Chekiang . . . . .11. O. shanghaiensis Will.

Willemse, 1925:13, 54, Figures 60, 61 —vicina Brunner-Wattenwyl, 1893, Ann. Mus Civ. Stor Nat. Genova, (2), XIII (XXXIII):152 (partim), Jakobson, 1905:201, 301 (partim), Kirby, 1914:198, 199 (partim)

23(22). Cerci in both sexes conical, long in the ♂, short and wider in the ♀, length of cercus in the ♂ 2 5-3 5 and in the ♀ 2-2 5 times greater than the greatest width (Figure 309). ♀ subgenital plate almost parallel-sided, gradually and slightly widening toward the apex, without lateral carinae or with short indistinct carinae, far from reaching the middle (Figures 293, 294, 312). ♀ ovipositor with slightly expressed apical tooth on the ventral valve (Figure 310).

24(25) Prosternal process in the ♀ sharply conical, with a narrow pointed apex (Figure 313), very rarely it is slightly widened in the middle part, then the tegmina have a narrow precostal field, the greatest width of which equals the greatest width of the median field ♂ subgenital plate with a distinct depressed groove on the dorsal aspect, extending from its apex toward its anterior margin (Figure 315), apex very often bipartite (Figure 314). Length ♂ 16.7-22.5, ♀ 22.5-29.6 mm, tegmina ♂ 11.4-21.6, ♀ 15.5-23.3 mm. —Khabarovsk Territory, Lower Amur Region Nikolaevsk on the Amur, Urkan, Tychan, Amur River, Maritime Territory, Railroad Station Okeanskaya, Vladivostok, Sidemi, Yakovlevka, Evgen'evka, mouth of the river Sudzukhe, Krivoi Klyuch, upper reaches of the Suputinka, Kamen'-Rybolov (Type from Yakovlevka). Injures rice in the Maritime Territory, where it

is known by the name of <u>O. adentata</u> Will . . . . *12. <u>O. maritima</u> Mistshenko sp. n.

Biology: Predtechenskii, Zhdanov and Popova, 1935:121 (as <u>O. adentata</u> Will.).

25(24). Prosternal process in the ♀ constricted at the base, distinctly widened in the middle part, with a wide slightly pointed apex (Figure 316). ♀ tegmina with a wide precostal field, the greatest
170 width of which is distinctly greater than the same width of the median field. ♂ subgenital plate without a groove on the dorsal aspect; dorsal aspect flat or convex; apex rounded, not bipartite.

26(27). ♀ abdomen with a distinct pointed spine at the postero-ventral angle of the second tergite (Figure 318). Cerci of the ♂ slender, beginning with the basal fourth, sharply narrowed toward the apex (Figure 319). Length of ♂ 24, ♀ 25.5 mm; tegmina ♂ 22, ♀ 23 mm. —North China: Manchuria. . . . . 13. <u>O. manzhurica</u> B.-Bienko.

Bei-Bienko, 1929, Konowia, VIII:105, Figures 2, 3.

27(26). ♀ abdomen without a spine at the postero-ventral angle of the second tergite. ♂ cerci stout, gradually narrowed apicad (Figure 320).

28(29). ♂ supraanal plate smooth, without transverse groove at the base (Figure 317). Subgenital plate in the ♂ with a wide blunted apex and with a flat dorsal aspect; in the ♀ with a smooth posterior margin,
171 without teeth (Figure 312). Length of ♂ 15.5-20.2, ♀ 23.0-28.5 mm; tegmina ♂ 9.0-16.5, ♀ 19.4-22.7 mm. —China: Ningsia (!), Suiyuan (!), Tsinghai (!), Shensi . . . . 14. <u>O. adentata</u> Will.

Willemse, 1925,11, 26, Figures 20-22.

29(28). ♂ supraanal plate with a transverse groove at the base (Figure 321). ♂ subgenital plate with a narrow rounded apex and a convex dorsal aspect; in the ♀ with 2-4 teeth on the posterior margin (Figure 295).

30(31). ♂ vertex narrow; its width between the eyes equal to the width of the frontal ridge between the antennae. Cerci of the ♂ conical. ♀ subgenital plate with 4 small teeth on the posterior margin (Figure 295). Length of ♂ 20.0-21.6, ♀ 30 mm; tegmina ♂ 18.5-23.0, ♀ 23 mm. —North China: Manchuria (According to Furukawa). . . . . .15. <u>O. nakaii</u> Furuk.

—<u>manchurica nakaii</u> Furukawa, 1939, Rep. of the first Scien. Exp. to Manchoukuo, Sect. V, Div. I, Part V, 16 83, 84, 121, 164, Figures 46^{1}, 47^{2}, 49^{1}, 49^{5}, 50^{2}, 51^{2}, 52^{2}, 53^{1}, 54^{1}, 55^{1}, 56^{1}, 57^{1}, 57^{3}, 58^{2}, 58^{7}, 59^{1}, 61^{1}, 61^{5}, 62^{1}, 65^{2}, 65^{3}, tab. XII, Figures 3, 12; tab. XVIII, Figures 2, 6, 13, tab. XIX, Figures 1, 5, 13, 15, 17, 22.

31(30). ♀ subgenital plate with 2 widely separated teeth on the posterior margin. ♂ unknown. Length of ♀ 28.6 mm, span of tegmina 67.6 mm. —Kashmir, Assam (According to Walker and Uvarov). . . . . 16. <u>O. apta</u> (Walk.)

Walker, 1870, Cat. Derm. Salt. Brit. Mus., IV 666 (Heteracris), Uvarov, 1926, Bull. Ent. Res., XVII:48. —velox Kirby, 1914:199, Figure 116 (partly).

32 (1). Tegmina and wings abbreviated, far from reaching the distal end of the hind femora.

33 (34). Tegmina and wings in both sexes extending far beyond the middle of the hind femora. ♀ subgenital plate with 2 small teeth on the posterior margin (Figure 322). Length of ♂ 28.5-31.9, ♀ 34.5-37.5 mm, tegmina ♂ 17.5-18.5, ♀ 18.5-25.5 mm. —North China· Manchuria, Japan. . . . . 17. O. japonica Will.

Willemse, 1925:12, 31, Figure 28 Furukawa, 1939, Rep. of the first Scien. Exp. to Manchoukuo, Sect. V, Div. I, Part V, 16 83, 91, 122, 161, 166, Figure 65[5]; tab. XIX, Figures 6, 10, 18, 23, 25. — vicina Brunner-Wattenwyl, 1893, Ann. Mus. Civ. Stor. Nat. Genova, (2), XIII (XXXIII):152 (partim)

34 (33). Tegmina and wings in both sexes far from reaching the middle of the hind femora. ♀ subgenital plate with a smooth posterior margin, this without teeth, with only a weak rounded median incision (Figure 323). Length ♂ 16-22, ♀ 18-25 mm, tegmina ♂ 6-12, ♀ 6.5-12.0 mm. —Japan· Sapporo. . . . . 18. O. yezoensis Shir.

Shiraki, 1910:53, 56, tab. II, Figures 7a-c. —yezoensis Willemse, 1925:11, 19, Figure 9.

172 11. Genus Gesonula Uv.

Uvarov, 1940, Ann. Mag. Nat. Hist., (11), V, 26 174 —Gesonia Stål, 1878, Bih. K. Svensk. Vet. Akad. Handl., V, 4-47, I Bolivar, 1918:7, 14 Tinkham, 1940.290, 297. —Racilia Shiraki, 1910.51, 58 (partly).

Type of genus Gesonula punctifrons (Stål)

Head short, considerably shorter than the pronotum. No foveolae Pronotum with a narrow median carina and colorless transverse grooves. Tegmina and wings well developed. Hind femora with ventral genicular lobe apically produced into a sharp spine. Hind tibiae flatly widened in the apical part with the margins of the dorsal aspect sharply distinguishable, the latter with internal and external apical spines and with 6-9 spines on the external margin but with 8-9 on the internal margin, the spines of the external margin project slightly outward, and the spines of the internal margin are not uniformly situated, the penultimate spine is far removed from the apical spine, the space between them being considerably greater than any space between the other spines. Prosternal process inclined caudad or straight and conical. Mesosternal lobes distinctly separated, not contiguous, the space between them wide, its narrowest part equal to or slightly less than the narrowest part of the mesosternal lobe Abdomen with well developed tympanal organ on the first tergite. ♀ ovipositor with the dorsal valves narrowed toward the tip, these being slightly larger than the ventral valves; dorso-external margin of dorsal valves entire, without a median incision, only with denticles of different sizes.

3 species are known, distributed in southeastern China, on the Island of Taiwan [Formosa], the Ryukyu Islands and the Philippines, on Malacca

peninsula, on the islands of the Malay archipelago, in New Guinea, in the Moluccas, and in Australia.

1(1). Vertex rather wide in both sexes; its width between the eyes equal to the width of the frontal ridge between the antennae. Hind tibiae in both sexes dirty bluish, reddish at the base, blackish at the apex. Mesosternum in both sexes with a rather narrow space between the lobes; its narrowest part equal to its length and distinctly less than the narrowest part of the mesothoracic lobe. *Dorsal valve of* ♀ *ovipositor* with small blunted teeth along the dorso-outer margin. Length of ♂ 17.0-18.1, ♀ 19-22 mm; tegmina ♂ 15.5-17.0, ♀ 17.0-22.5 mm. —China: Szechwan, Kiangsi, Fukien, Kwangsi, Kwantung, Hainan Island, Taiwan; Ryukyu Islands. Slightly damages mulberry tree in China. . . . . 1. G. punctifrons (Stål.)

Stål, 1860, Kongl. Freg. Eug. Resa Zool., V, Orth.:336 (Acridium (Oxya)). Tinkham, 1940:297 (Gesonia).—okinawaensis Shirald, 1910:58, tab.I, Figures 9a-c (Racilla); Matsumura, 1911, Mem. Soc. Ent. Belgique, XVIII:130 (Racilla).

Biology: Ramakrishna Ayyar and Krishna Menor, 1933, *Journ. Bomb. Nat. Hist. Soc.*, XXXVI:517-518.

12. Genus Caryanda Stål.

Stål, 1878, Bih. K. Svensk. Vet. Akad. Handl., V, 4:47; Kirby, 1914:192, 201; I. Bolivar, 1918:8, 19, Tinkham, 1940:301.

Type of genus: Caryanda spuria (Stål), Java, Sumatra.

Head short; considerably shorter than the pronotum. No foveolae. Pronotum with a narrow median carina and colorless transverse grooves.
173 Tegmina greatly abbreviated, hardly extending beyond the base of the hind femora. Wings hardly noticeable. Hind femora with a ventral genicular lobes apically produced into a sharp spine. Hind tibiae not flattened in the apical half and hardly widened; margins of dorsal side rounded; dorsal aspect with external and internal apical spines and with 9-10 spines on the external margin; they project slightly outward. Prosternum with a conical process. Mesosternal lobes distinctly separated, not contiguous, the space between them narrow; its narrowest part distinctly less than the narrowest part of the mesosternal lobe. Abdomen with well-developed tympanic organ on the first tergite. ♀ ovipositor with dorsal valves narrowed on the apex, these being nearly equal to the ventral valves; dorso-external margin of dorsal valves entire, without median incision, only with denticles of different sizes.

Eleven species are known; distributed in West Africa, in Burma, on the islands of the Malay Archipelago, in Indo-China, and in southeastern China.

1(2). ♀ pronotum with strongly curved posterior transverse groove; posterior margin with a distinct triangular median incision (Figure 324). Prosternal process of ♀ wide; its greatest width equal to its height (Figure 325). ♀ *vertex wide; its* greatest width in front of the eyes almost twice more than its lateral margin taken from the anterior margin of the eye to the fastigium. Tegmina in the ♀ narrow, extending beyond the posterior margin of the second abdominal tergite.

♂ unknown. Length of ♀ 24.5, tegmina 5.0 mm —China: Szechwan (according to Chang) . . . . 1. C. methiola Chang.

Chang, 1939, Notes Ent. Chinoise, VI, 1:39, 43, tab. I, Figures 5, 6, 9, tab. III, Figure 4.

2(1). ♀ pronotum with nearly straight posterior transverse groove; posterior margin rounded or hardly emarginate at the median carina (Figures 326, 327). Prosternal process in the ♀ narrow; its greatest width 1/2 its height (Figure 328).

3(4). ♀ vertex strongly projecting forward, its greatest width in front of the eyes 1.5 times greater than its lateral margin taken from the
174 anterior margin of the eye to the fastigium (Figure 326). Pronotum in the ♀ with weakly emarginate posterior margin; the length of its anterior part nearly twice greater than the greatest length of its posterior part (Figure 326). ♀ tegmina wide, extending beyond the posterior margin of the second abdominal tergite. ♂ unknown. Length of ♀ 29.0, tegmina 6.5 mm. —China· Szechwan (according to Chang) . . . . 2. C. sinensis Chang.

Chang, 1939, Notes Ent. Chinoise, VI, 1:39, 45, tab. I, Figures 3, 4, 7, tab. III, Figure 2.

4(3). ♀ vertex slightly projecting forward, its greatest width in front of the eyes nearly twice greater than its length taken from the anterior margin of the eye to the fastigium (Figure 327). Pronotum of ♀ with roundly projecting posterior margin; the length of its anterior part 1.5 times greater than the greatest length of its posterior part (Figure 327). ♀ tegmina wide, extending beyond the posterior margin of the first abdominal tergite. ♂ unknown. Length of ♀ 28.5, tegmina 5.3 mm. —China Szechwan. (according to Chang). . . . . .3. C. omeiensis Chang.

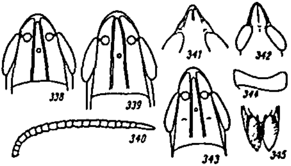
Chang, 1939, Notes Ent. Chinoise, VI, 1 39, 47, tab. I, Figure 8.

13. Genus Leptacris Walk.

Walker, 1870, Cat. Derm. Salt. Brit. Mus., IV 676, Kirby, 1914 191, 210, Uvarov, 1944 15, 18.— Ischinacrida Stål, 1873, Ofver. Kongl. Veten.-Akad. Forhand., XXX, 4 53 —Ischnacrida Stål, 1873, Recens. Orth., I 44, 87, Kirby, 1914:191, 212, Tinkham, 1940 282. —Capellea I. Bolivar, 1902, Ann. Soc. Ent. France, LXX-616.

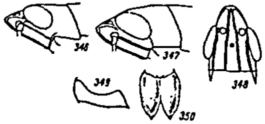
Type of genus Leptacris filiformis Walk , southern India, Ceylon.

Head large, its length 4/5 the length of the pronotum or nearly equal to it Foveolae rather distinct, far from reaching the fastigium Pronotum with a narrow median carina. Tegmina and wings well developed, costal field of ♂ tegmina strongly widened, its greatest width 1 5 to 2 times greater than the greatest width of the precostal field. Hind femur with a weakly rounded ventral genicular lobe, the lobe without a spine on the apex Hind tibiae dorsally with external and internal apical spines and with 18-21 spines on the external margin, the spines in the ventral part are short, projecting slightly outward. Prosternal process small. Mesosternal lobes contiguous for their whole extent. Abdomen with well-developed



Figures 338-345
(Figure 342 according to Uvarov, the rest original)

338—Tropidopola cylindrica iranica Uv., ♂, head, front view, 339—T. cylindrica iranica Uv., ♀, ibid.; 340—T. cylindrica iranica Uv., ♀, right antenna from above, 341—T. turanica turanica Uv., ♂, vertex from above, 342—T. longicornis graeca Uv., ♂, head from above; 343—T. turanica turanica Uv., ♂, head, front view; 344—T. turanica turanica Uv., ♂, left cercus from the side, 345—T. turanica turanica Uv., ♀, ovipositor from above.



Figures 346-350
(Original)

346—Tropidopola turanica turanica Uv., ♂, head from the side; 347—T. turanica iliensis B.-Bienko, ♂, ibid.; 348—T. longicornis graeca Uv., ♂, head, front view, 349—T. longicornis graeca Uv., ♂, left cercus from the side; 350—T. longicornis graeca Uv., ♀, ovipositor from above.

tympanic organ on the first tergite. Subgenital plate of ♂ long, its length equal to or slightly greater than that of the pronotum. ♀ ovipositor with long dorsal valves narrowed toward the tip, which are nearly equal to the ventral valves, dorso-external margin of dorsal valves entire, without median incision, ventral valves long, their external ventral margin smooth, pulvilli with smooth apical margin.

About 15 species are known, these being distributed in Africa, Madagascar, Ceylon, India, several islands of the Malay Archipelago, and in southeastern China.

1(1). ♂ frontal ridge punctate, its margins contiguous in the dorsal part, diverging toward the clypeus. ♂ antennae sword-shaped. ♂ pronotum finely punctate with a rounded posterior margin Supraanal plate of
175 ♂ triangular, laterally compressed, with a deep longitudinal groove. ♀ unknown. Length of ♂ 45 0, tegmina 27.5 mm. —China Kiangsu (according to Tsai) . . . . .1. L. liyang (Tsai).

Tsai, 1929, Journ. Coll. Agric. Tokyo Imp. Univ., X, 2 141, Figures 2A-C (Ischnacrida).

14. Genus Tropidopola Stål.

Stål, 1873, Recens, Orth., I 42 Jakobson, 1905 173, 202, 306 Uvarov, 1926:153, Uvarov, 1927a 167, 173, Tarbinskii, 1940 20, 148, 151, Uvarov, 1944 14, 16.—Opsomala Burmeister, 1838, Handb. Ent., II 610 (partim) —Opomala Fischer, 1853, Orth. Eur. :296, 305.

Type of genus Tropidopola cylindrica (Marsch) (=Opsomala fasciulata Charp.), Sicily.

Head large, its length slightly less than that of the pronotum. Foveolae distinct, far from reaching the fastigium. Pronotum with a narrow median carina. Tegmina and wings well developed, costal field of ♂ tegmina weakly widened, its greatest width equal to the greatest width of the precostal field. Hind femur with a weakly rounded ventral genicular lobe, which is without a spine on the apex. Hind tibiae with external and internal apical spines dorsally and with 11-13 spines on the external margin, the spines in the ventral part being short and weakly projecting outward. Prosternal process straight, widened at the blunt apex Mesosternal lobes usually partly contiguous, sometimes hardly separated, with a very narrow space between them. Abdomen with well-developed tympanic organ on the first tergite. Subgenital plate in the ♂ short, its length distinctly less than that of the pronotum. ♀ ovipositor with short dorsal valves narrowed toward the tip, which are nearly equal to the ventral valves, dorso-external margin of dorsal valves entire, without median incision, ventral valves short, their ventro-external margin with callous-like teeth, pulvilli with callous-like teeth on the apical margin.

Five species, in the southern part of western Europe, in Africa, and in Asia, are known.

1(4). Vertex wide, moderately projecting forward, its greatest width in front of the eyes, taken between the inner margins of the foveolae, is equal to or distinctly greater than its lateral margin taken from the anterior margin of the eye to the fastigium (Figures 329, 330).

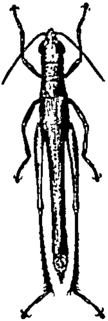


Figure 351. Tropidopola turanica turanica Uv., ♂. (Original)

Figures 352–353. Left cercus in ♂ from the side. (Original)

352—Pezotettix giornae (Ross.); 353—P. anatolica Uv.

Figure 354. Pezotettix giornae (Ross.), ♂. (Original)

2(3). Mesosternal lobes in the ♂ hardly, but distinctly, separated, the space between them being very narrow. ♂ cerci with a sinuous ventral margin and with strongly arcuately concave dorsal margin, apical margin with a distinct triangular wide incision (Figure 331). ♀ unknown. Length ♂ 34, tegmina 22.5 mm. —Transbaikal ("Daourea"). (According to Uvarov) . . . . *1. T. daurica Uv.

Uvarov, 1926:161, 172, Figure 3.

3(2). Mesosternal lobes in both sexes contiguous in the middle part (Figure 332). ♂ cerci strongly compressed in the middle part, distinctly widened toward the base and apex, their ventral and dorsal margins nearly equal, arcuately concave, apical margin slightly arcuately concave (Figures 333, 334) . . . . . 2. T. cylindrica (Marsch.)

a(b). ♂ frontal ridge nearly parallel-sided, in the ♀ not reaching the clypeus
76 and not constricted under the median ocellus (Figures 335, 336). Third, fourth, and sixth segments of ♀ antennae elongated; the length of an individual segment distinctly greater than its greatest width (Figure 337). ♂ cerci with broadly rounded dorsal-apical angle (Figure 333). Length of ♂ 28-32, ♀ 32-34 mm, tegmina ♂ 20-23, ♀ 26-28 mm. — Iran· Luristan, Khuzistan, Iraq . . . .2a. T. cylindrica obtusa Uv.

Uvarov, 1926:161, 166, Figures 6, 7. —obtusa Uvarov, 1922, Journ. Bomb. Nat. Hist. Soc., XXVIII 365, Figure B.

b(a). Frontal ridge in ♂ gradually diverging toward the clypeus and in the ♀ reaching the clypeus, slightly constricted under the median ocellus (Figures 338, 339). Third, fourth, and sixth segments of ♀ antennae transverse, the length of an individual segment considerably less than its greatest width (Figure 340). ♂ cerci with a hardly rounded dorso-apical angle (Figure 334). Length of ♂ 30.6-34.1, ♀ 42.2-44.4 mm, tegmina ♂ 19.6-22.1, ♀ 26.2-27.8 mm. —Iran Seistan, Iranian Baluchistan, Mekran . . . . 2b. T. cylindrica iranica Uv.

Uvarov, 1933, Trudy Zoologicheskogo instituta AN SSSR, (1932), I 226.

4(1). Vertex narrow, projecting strongly forward, its greatest width in front of the eyes, taken between the inner margins of the foveolae, considerably less than its lateral margin, taken from the anterior margin of the eye to the fastigium (Figures 341, 342).

5(6). Frontal ridge in both sexes nearly parallel-sided, distinctly narrowed
177 at the fastigium (Figure 343). ♂ cerci with an obtuse ventro-apical angle (Figure 344). ♀ ovipositor with an irregular group of 6-8 distinct black tubercles (Figure 345) on the dorsal aspect of the dorsal valves . . . .*3. T. turanica Uv.

a(b). Head weakly sloping. Frons slanting. The fastigium lies on a line with the occiput (Figure 346). Length of ♂ 32.3-41.5, ♀ 36.5-51.1 mm; tegmina ♂ 20.6-27.0, ♀ 24.5-35.0 mm. —Transcaucasia, Middle Asia; northern Iran, northern Afghanistan (Figure 351) . . . .*3a. T. turanica turanica Uv.

—cylindrica Jakobson, 1905:202, 306 (partim). —turanica Uvarov, 1926:161, 168, Figures 1, 8, Uvarov, 1927a:173, Figures 205, 220-224, Tarbinskii, 1940:20, 151. —turanica caspica Uvarov, 1933, Trudy Zoologicheskogo instituta AN SSSR, (1932), 1-225.

178 b(a). Head very strongly slanting. Frons nearly horizontal, especially in the ♂. Fastigium lying considerably below the occiput (Figure 347). Length ♀ 36.4, ♀ 45.6-51.2 mm; tegmina ♂ 24.7, ♀ 30.4-33.5 mm. — Eastern Kazakhstan: Ili River.*3b. T. turanica iliensis B.-Bienko.

Bei-Bienko, 1948, Izvestiya AN Kazakhskoi SSR, seriya zoologicheskaya, 8:194, Figure 4.

6 (5). Frontal ridge gradually narrowed toward the fastigium (Figure 348). ♂ cerci with an acute produced pointed ventro-apical angle (Figure 349). ♀ ovipositor with a regular row of tubercles consisting of several, sometimes effaced, tubercles (Figure 350), on the dorsal aspect of the dorsal valves. Length ♂ 27.6-33.0, ♀ 38.4-43.6 mm; tegmina ♂ 17.2-22.1, ♀ 25.6-29.4 mm. —Greece, Cyprus, Asia Minor. . . . . 4. T. longicornis graeca Uv.

Uvarov, 1926:161, 173, Figures 11-13.

15. Genus Pezotettix Burm.

Burmeister, 1840, Zeit. Ent., II:51, Jakobson, 1905:173, 201, 302 (partly); Uvarov, 1925B,86, 88, Tarbinskii, 1940:20, Tarbinskii, 1948:109, 110. —Pelecyclus Fieber, 1853, Lotos, III:119. —Platyphyma Fischer, 1853, Orth. Eur.:298, 373. —Pelecycleis Fieber, 1854, Lotos, IV:196,

Type of genus: Pezotettix giornae (Ross.).

Body smooth. Foveolae indistinct. Pronotum with a low, slightly raised, median carina. Tegmina strongly abbreviated, distinctly narrowed toward the apex. Wings hardly perceptible. Hind femur with a rounded ventral genicular lobe. Hind tibiae dorsally with external and internal apical spines and with 10-11 spines on the outer margin, these being short and slightly projecting outward at the ventral part of the tibia. Prosternal process wide, wedge-shaped, with an incision on the apex. Abdomen with a well-developed tympanic organ on the first tergite. ♀ ovipositor with the dorsal valves narrowed toward the tip and nearly equal to the ventral valves; dorso-external margin of dorsal valves entire, without median incision, only with denticles.

Eight species known, distributed in southern Europe, in North Africa, and in western Asia.

1 (2). Tegmina in the ♀ narrow; tegmina twice as long as their greatest width. ♂ cerci conical, pointed; dorsal margin of cercus straight (Figure 352). Length of ♂ 9.2-15.0, ♀ 12-18 mm; tegmina ♂ 0.8-2.8, ♀ 2.5-3.2 mm. —Moldavia, western Ukraine, northern Caucasus; Morocco, Algiers, southern and Central Europe, and Asia Minor (?) (Figure 354). . . . . *1. P. giornae (Ross.)

179 Rossi, 1794, Mantiss. Insector., II:104 (Gryllus), Brunner-Wattenwyl, 1882 230, tab. VII, Figure 54 (Platyphyma), Tarbinskii, 1940 20, Tarbinskii, 1948:110.—commune Costa, 1836, Fauna del Regno di Napoli Ortotteri:48, tab. IV, Figures 6A, b, d, 7A, b, d (Podisma).—giornae var. rufipes Brunner-Wattenwyl, 1882:231 (Platyphyma).—giornai Jakobson, 1905:201, 302, plate VII, Uvarov, 1925c 88, Figures 97, 100.

Biology Dovnar-Zapol'skii, 1926:171.

2(1). Tegmina in the ♀ wider; tegmina 1.5 times longer than their greatest width. ♂ cerci strongly widened toward the apex, dorsal margin of cercus strongly emarginated (Figure 353). Length ♂ 14.0-14.5, ♀ 17.4-18.0 mm; tegmina ♂ 2.4-2.5, ♀ 2.5-3.0 mm. —Asia Minor . . . . 2. P. anatolica Uv.

Uvarov, 1934, Eos, X 112, Figures 34A, 34A, ♀.—platycercus Jakobson, 1905 202, 303 (partly).

16. Genus Sphenophyma Uv.

Uvarov, 1934, Eos, X 114.—Platyphyma Stål, 1876, Bih. Svensk. Vet. Akad. Handl., IV, 5 17 (partly).—Pezotettix Jakobson, 1905 173, 201, 302 (partim).

Body rugose. Foveolae distinct Pronotum with strongly raised pectinate median carina. Tegmina strongly abbreviated, widened toward the apex. Wings hardly perceptible. Hind femur with rounded ventral genicular lobe. Hind tibiae with internal and external apical spines on the dorsal aspect and with 10-11 spines on the external margin, these being short, and slightly projecting outwards in the ventral part of the tibia. Prosternal process transverse, wide, wedge-shaped, with an incision at the apex and weakly slanting forward. Abdomen with well-developed tympanic organ on the first tergite. ♀ ovipositor with the dorsal valves narrowed toward the tip, nearly equal to the ventral valves, dorso-external margin of dorsal valves entire, without median incision, only with denticles.

Only 1 species from Hither Asia is known.

180 1(1). Vertex in both sexes wide; its width between the eyes twice as wide as the frontal ridge between the antennae, tegmina narrow in both sexes; the length of the tegmina 2.5 times greater than its greatest width Supraanal plate of the ♂ nearly quadrate, with a distinct triangular process in the middle of the lateral margins and with a distinct median triangular process on the posterior margin Subgenital plate of the ♀ longitudinal; its apex with a wide median process, the apex of which also has a median triangular process. Length 15.5-16.5, ♀ 19-23 mm, tegmina ♂ 2.9-3.5, ♀ 3.1-3.7 mm. —Eastern Turkey, Syria . . . . 1. S. rugulosa (Stål.)

Stål, 1876, Bih. Svensk. Vet. Akad. Handl., IV, 5 18 (Platyphyma).—rugulosus Jakobson, 1905: 202, 303 (Pezotettix).

17. Genus Conophymacris Will.

Willemse, 1933, Natuurh. Maandblad, XXII, 2 16

Type of genus: Conophymacris chinensis Will.

No foveolae. Pronotum with a ventral linear carina and with distinct [or sharp] lateral carinae developed for its whole extent. Tegmina greatly abbreviated, lateral, wide; length of tegmina 1.5-twice greater than their greatest width. Wings hardly perceptible. Hind femur with rounded ventral genicular lobe. Hind tibiae with external and internal apical spines on the dorsal aspect and with 12-14 spines on the external margin; spines in the ventral part of the tibia short, slightly projecting outward. Prosternal process conical, pointed. Abdomen with a well-developed tympanic organ on the first tergite. ♀ ovipositor with dorsal valves narrowed toward the tip, these nearly equal to the ventral valves; dorso-external margin of dorsal valves entire, without median incision, only with denticles of different sizes.

Only 2 species from southeastern China are known.

1(2). Frontal ridge in both sexes almost flat, slightly depressed only near the median ocellus. Antennae in both sexes stout; the length of an individual median segment of the antenna 2.25 times greater than its greatest width. Hind femora in both sexes with unicolored black inner aspect. Length of ♂ 20-24, ♀ 25.5-39.0 mm; tegmina of ♂ 4-5, ♀ 5.5-6.0 mm. —China: Szechwan .... 1. C. chinensis Will.

Willemse, 1933, Natuurh. Maandblad, XXII, 2.17, Figure 2.

2(1). Frontal ridge in both sexes distinctly depressed for nearly its whole length. Antennae in both sexes slender; length of an individual middle segment of the antenna 3-4 times greater than its greatest width. Hind femora in both sexes with 2 light bands on the black inner aspect. Length ♂ 27.0-31.6, ♀ 39.2-40.0 mm; tegmina ♂ 4.5-5.3, ♀ 7.0-7.2 mm. —China: Szechwan. ...... 2. C. szechwanensis Chang.

Chang, 1937, Notes Ent. Chinoise, IV, 8:188, tab. IV, Figure 6.

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18. Genus Paraconophyma Uv.

Uvarov, 1921, Ann. Mag. Nat. Hist., (9), VII:497.—Mesambria Kirby, 1914:193, 220 (partim). Type of genus: Paraconophyma politum Uv., India.

Foveolae distinct, but sometimes completely absent. Pronotum with a low linear carina and with lateral carinae reaching only to the anterior or the posterior transverse groove. Tegmina strongly abbreviated, lateral, narrow; length of tegmina 3-4 times greater than their greatest width. Wings hardly perceptible. Hind femur with a rounded ventral genicular lobe. Hind tibiae dorsally with external and internal apical spines and with 9 spines on the outer margin; the spines in the ventral part of the tibia strongly projecting outward. Prosternal process conical, pointed. Abdomen with a well-developed tympanic organ on the first tergite. ♀ ovipositor with dorsal valves narrowed toward the tip, these being nearly equal to the ventral valves; dorso-external margin of dorsal valves entire, without median incision, only with denticles of different sizes.

Six species, occurring in the mountains of Afghanistan, Kashmir, and northern India, are known.

1(2). Foveolae in the ♀ distinct. Frontal ridge in the ♀ narrow, its width between the antennas equal to the width of the vertex between the eyes. ♀ antennae rather slender, the length of an individual median segment of the antenna 1.5 times greater than its greatest width. Pronotum of ♀ without light lateral bands. ♀ ovipositor valves with pointed ends; dorso-external margin of dorsal valves and ventro-external margin of ventral valves with a distinct arcuate incision ♂ unknown Length of ♀ 19 7, tegmina 3.7 mm. —Kashmir: source of the River Chenab. . . . . .1. P. kashmiricum Mistsh.

Mishchenko, 1950, Doklady AN SSSR (novaya seriya), LXXII, 1.213, Figure 1[1].

2(1). No vertexal pits in the ♂. Frontal ridge of ♂ wide; its width between the antennas 1.5 times greater than the width of the vertex between the eyes. Antennas in the ♂ stout, the length of an individual middle segment of the antenna nearly equal to its greatest width. Pronotum of the ♂ with 2 light lateral bands. Anal plate in the ♂ narrow, trapezoidal, with posterior angles projecting laterad, and with a transverse pad in the middle, this having a tooth at the lateral margins. The ♀ is unknown. Length of ♂ 10 5, tegmina 1 8 mm. —Afghanistan· Unai Pass . . . . 2. P. minutum B.-Bienko.

—minuta Bei-Bienko, 1949, Doklady AN SSSR (novaya seriya), LXVII, 1 174, Figure 1m.

19. Genus Bienkoa Mistsh.

Mishchenko, 1950, Doklady AN SSSR (novaya seriya), LXXI, 4 791.—Conophyma Jakobson, 1905 173, 202, 203 (partim); Uvarov, 1927a:175 (partim)

Body entirely apterous. Foveolae indistinct Pronotum with a low linear carina. Hind femur with a rounded ventral genicular lobe. Hind tibiae with external and internal apical spines on the dorsal aspect and with
182 10-12 spines on the external margin, spines of the ventral part of tibia short, weakly projecting outward. Prosternal process conical, pointed. Abdomen with a distinct tympanic organ on the first tergite, last tergite in the ♂ medially slit with 2 distinct small lobes on the posterior margin. ♀ ovipositor with dorsal valves narrowed toward the tip, these nearly equal to the ventral valves, dorso-external margin of dorsal valves entire without a median incision, only with several denticles.

Only 1 species, subdivided into 3 subspecies and living in the Zeravshan Range and the Pamir-Alai Mountains, is known

1(1). Abdomen in both sexes usually with 3 light longitudinal bands dorsally. Lobes of the last abdominal tergite in the ♂ reaching 1/4 to 1/3 the greatest length of the anal plate, and being triangular Supraanal plate in the ♂ smooth, trapezoidal ♂ cerci long, conical, reaching or extending beyond the apex of the subgenital plate ♀ ovipositor with several small denticles and one distinct tooth on the ventro-external margin

of the ventral valves . . . . *1. B. fedtshenkoi (Zub.)—Fedchenko's "young mare" grasshopper [Kobylka Fedchenko].

a(d). Mesosternum in both sexes with a fairly wide space between the lobes; its narrowest part in the ♂ equal to its length and 1/2 the greatest width of the mesosternal lobe, but in the ♀ 1.25 times greater than its own length (Figure 355). Supraanal plate in the ♂ with rounded or straight posterior margin (Figures 356, 357).

183 b(c). Pronotum in the ♂ with distinct transverse grooves; lateral carinae anteriorly distinct, sharply convergent toward the median carina. Basic coloring in the ♂ nearly unicolored yellow-brown. The ♀ is unknown. Length of ♂ 15.4, hind femur 9.2 mm. —Zeravshan Range. *1a. B. fedtshenkoi fedtshenkoi (Zub.)

—fedtschenkoi Zubovskii, 1899, Trudy Russkogo entomologicheskogo obshchestva, XXXIV:23 (Conophyma), Jakobson, 1905:202, 304 (Conophyma), Uvarov, 1927a:179, 183 (Conophyma) (partim).

c(b). Pronotum in the ♂ with distinct posterior transverse groove; the 2 weak anterior grooves; lateral carinae in the anterior part effaced, weakly convergent toward the median carina. Basic coloring in both sexes black, blackish, or greenish, with a distinct light marking. Length of ♂ 17.2-20.6, ♀ 21.5-26.5 mm; hind femur ♂ 9.8-10.9, ♀ 11.4-13.5 mm. – Hissar Range, Baba-tag and western part of Darvaza Range. Injures young crops of wheat and alfalfa on the slopes of the Hissar mts. (Figure 360) . . . . . *1b. B. fedtshenkoi ornata (Rme.)—Decorated 'young mare' grasshopper [Kobylka ukrashennaya].

—fedtschenkoi Uvarov, 1927a 179, 183, Figure 230 (Conophyma) (partly). —fedtschenkoi ornatum Ramme, 1931, Mitt. Zool. Mus. Berlin, XVII:198, Figures 12-13 (Conophyma).

Biology: Bei-Bienko, 1932b 28, Predtechenskii, Zhdanov and Popova, 1935:87; Mishchenko, 1949b·164.

d(a). Mesosternum in both sexes with a wide space between the lobes; its narrowest part in the ♂ is 1.25, in the ♀ 1.5 times greater than its length and in the ♂ 4/5-2/3 the greatest width of the mesothoracic lobes (Figure 358). Anal plate in the ♂ with a doubly-emarginate posterior margin (Figure 359). Length of ♂ 15.0-17.3, ♀ 16.5-23.4 mm; hind femur ♂ 9.2-10.2, ♀ 10.1-11.8 mm. —Peter the First Range: Gardan-i-kaftar, Gursi-tash River, Kulika River; eastern part of the Darvaza Range: Sagyr-dasht, Sary-zakh-bursi, Viskharvibole. (Type from the Gursi-tash River) . . . . *1c. B. fedtshenkoi accola Mistshenko subsp. n.

20. Genus Thaumatophyma Rme.

Ramme, 1939, Mitt. Zool. Mus. Berlin, XXIV 148.
Type of genus: Thaumatophyma cercatum Rme.

Body entirely apterous. Pronotum with a low linear carina. Prosternal process in the ♂ low, bluntly conical, in the ♀ slightly elevated. Last abdominal tergite in the ♂ not medially split (judging from Ramme's drawing),

 with 2 small lobes. ♂ cerci very long, pointed, curved upward. Anal plate in the ♂ acute-angled. ♀ ovipositor without a tooth on the ventro-external margin of the ventral valve. (According to Ramme).

Two species known from the mountains of Afghanistan

1 (2). Hind tibiae and hind tarsi in both sexes yellowish-gray; hind tibia in the ♀ sometimes light reddish at the apex. Length of ♂ 14.5, ♀ 14.6 mm, of hind femur in the ♂ 7.5, ♀ 7.7 mm. —Western Afghanistan, Hindu Kush (According to Ramme). 1. Th. cercatum Rme.

Ramme, 1939, Mitt. Zool. Mus. Berlin, XXIV:149, Figures 59a-c.

2 (1). Hind tibiae and hind tarsi in the ♀ coral-red. The ♂ unknown. Length of ♀ 15, of hind femur 8.2 mm. —Afghanistan Pegman Mountain Range (According to Ramme). . . .2. Th. corallipes Rme.

Ramme, 1939, Mitt Zool. Mus. Berlin, XXIV 149.

21. Genus Conophyma Zub.

Zubovskii, 1898, Ezhegodnik Zoologicheskogo muzeya AN, III 105, Jakobson, 1905 173, 202, 303 (partly) Uvarov, 1927a:167, 175 (partly). —Pamiracris Ramme, 1930, Mitt. Zool. Mus. Berlin, XVI 212 (syn. nov.).

Type of genus Conophyma semenovi Zub

Body entirely apterous. Foveolae indistinct or absent Eyes irregularly oval; vertical diameter of the eye in the ♂ slightly greater than the subocular groove, in the ♀ equal to it. Pronotum with a low linear median carina. Middle femora in the ♂ slightly thickened. Hind femur with rounded ventral genicular lobe. Hind tibiae on the dorsal aspect with an outer apical spine and 9 to 11 spines along the outer margin, spines in the lower part of the tibia short, slightly projecting outwards. Prosternal process conical, sometimes slightly developed in the ♀. Tympanic organ lacking on the first abdominal tergite. Last abdominal tergite in the ♂ split in the middle. ♂ cerci (if examined from above) narrow, long, with the sides strongly compressed; in the ♀, conical in profile, gradually narrowing to the apex, length of cercus in the ♀, always greater than the greatest width in profile. Supraanal plate in the ♂ triangular, quadrate, or trapezoidal. Epiphallus in the ♂ transverse, its greatest width several times greater than its greatest length. ♀ ovipositor with dorsal valves narrowed toward the tip, these nearly equal to the ventral valves, dorso-external margin of dorsal valves entire, without median incision.

There are 68 species known, distributed mainly in the mountains of Middle Asia [i. e., = Soviet Central Asia], 2 species in the Hindu Kush, 2 in the Himalayas, 1 in Kashmir, 1 in northwestern Pakistan, and 1 in the Boro-Khoro Range†

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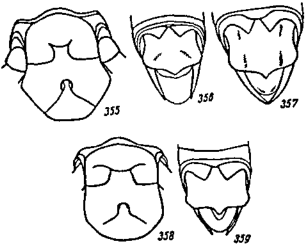
† Species of this genus can be exactly determined only from the ♂♂ because the ♀♀ of many species practically do not differ from each other



Figures 355–359
(Original)

355—Bienkoa fedtshenkoi ornata (Rme.), ♂, meso- and metathorax from below; 356—B. fedtshenkoi fedtshenkoi (Zub.), ♂, tip of abdomen from above; 357—B. fedtshenkoi ornata (Rme.), ♂, ibid, 358—B. fedtshenkoi accola Mistshenko subsp. n., ♂, meso- and metathorax from below (paratype), 359—B. fedtshenkoi accola Mistshenko subsp. n., ♂, tip of abdomen from above (type).

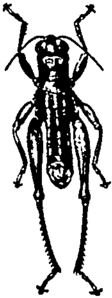


Figure 360. Bienkoa fedtshenkoi ornata (Rme.), ♂, (Original)

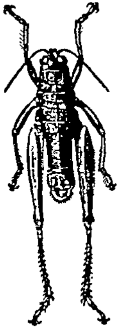


Figure 361. Conophyma almasyi almasyi (Kuthy), ♂, (Original)

185 1 (58). Body in both sexes unicolored dorsally (green, olive, brown, or black), without light lateral longitudinal bands, sometimes only some abdominal tergites have 2 light isolated spots, then the body is green dorsally. ♀ ovipositor with only a few small denticles (Figure 362) along the ventro-outer margin of the ventral valves.

2 (17). Hind femurs of the ♂ with the dorsal part of the inner aspect, sometimes almost all the inner aspect, dark

3 (10). Pronotum in both sexes with unicolored lateral lobes, the lobe without a light spot near the ventral margin.

4 (5). ♂ cerci in profile blunt, wide, very slightly narrowed toward the apex (Figure 363). Supraanal plate in the ♂ nearly quadrate, its posterior angles rounded, projecting forward (Figure 364). Length of ♂ 14.5, ♀ 19.0-22.1 mm, of hind femur ♂ 9.6, ♀ 11.3-12.2 mm. —Western part of Trans-Ili Ala Tau· Sary-dzhas. . . . . *1. C. iliense Mistshenko sp. n.

5 (4). ♂ cerci in profile pointed, conical, strongly narrowed toward the apex (Figure 365).

6 (9). Meso-, metanotum, and first abdominal tergite in the ♂ weakly rugose, with large points only

7 (8). Vertex in the ♂ with a distinct median carina, its width between the eyes twice more than the width of the frontal ridge between the antennae Mesothorax in both sexes with a wide space between the lobes, its narrowest part in the ♂ is 1.5, in the ♀ 2 25 times greater than its length. Hind tibiae in the ♂ yellow Supraanal plate in the ♂ nearly quadrate, its posterior angles slightly projecting at the sides (Figure 366). Length of ♂ 17.8, of ♀ 20.1-23.5 mm, of hind femur
186 in the ♂ 9.6, ♀ 11 3-12 2 mm —Trans-Ili Ala Tau Lake Issyk Kul . . . . *2. C. leve Mistshenko sp. n.

8 (7). Vertex in the ♂ without median carina, its width between the eyes 1 5 times greater than the width of the frontal ridge between the antennae Mesoternum in both sexes with moderately wide space between the lobes, its narrowest part in the ♂ is equal to its length, in the ♀ it is 1.5 times greater than its length. Hind tibiae in the ♂ bluish. Anal plate in the ♂ trapezoidal, its posterior angles rounded, slightly projecting at the sides (Figure 367). Length of ♂ 19.5, ♀ 24.5 mm, of hind femur in the ♂ 11, ♀ 13.8 mm. —Northwestern China Boro-Khoro Range (Kash). . . . . 3. C. herbaceum Mistshenko sp n.

9 (6). Meso-, metanotum and first abdominal tergite in the ♂ strongly and coarsely rugose. Anal plate in the ♂ trapezoidal (Figure 149, 368-371) . . . . *4. C. almasyi (Kuthy).

a (f). Mesosternum in both sexes with a moderately wide space between the lobes, its narrowest part in the ♂ equal to, in the ♀ 1 5-2 times its length.

b (e). Hind femur in the ♂ with a light or faint greenish ventral genicular lobe on the outer side. Hind tibiae in the ♂ with a light or faint greenish base.

c (d). ♂ cerci black. Length of ♂ 13.5-19.5, ♀ 20 5-29 5 mm, of hind femur in the ♂ 8.5-10.8, ♀ 10.2-13.9 mm —Kirghiz, Talass Ala Tau, Susamyr Tau, Terskei Ala Tau mountain ranges (Figure 361). . . . . *4a C almasyi almasyi (Kuthy)

—Almasyi Kuthy, 1905, Ann. Mus. Nat. Hung., III:216, 218 (Podisma, subgen. Pezotettix). — semenovi Uvarov, 1927a:178, 182 (partim).

d (c). ♂ cerci light. Length of ♂ 17.8-18.2, ♀ 27.6 mm; of hind femur in the ♂ 9.1-11.3, ♀ 10.8-13.5 mm. —Degerez mts. (southeastern Kazakhstan). . . . *4b. C. almasyi fragosum Mistshenko subsp. n.

e (b). Hind femur in the ♂ with a dark ventral genicular lobe on the outer aspect. Hind tibia in the ♂ with a dark base. Length of ♂ 15.5-19.5, ♀ 20.5-25.2 mm; of hind femur in the ♂ 0.1-11.3, ♀ 10.8-13.5 mm. —Trans-Ili Ala Tau: the Malaya Almatinka River, Dzhure, the Bol'shaya Almatinka River, Malovodnoe village; Kungei Ala Tau: upper part of the River Taldy-su, gorge of Ort-koi-su; range of Sary-dzhas: Labasa Mountain, Chilik River; range of Ketmen: Dumalak natural boundary south of Ak-su; Terskei Ala Tau; mountains along the Bol'shoi Kokpak River. (Type from Labasa). . . . . *4c. C. almasyi rugosum Mistshenko subsp. n.

—semenovi Uvarov, 1927a:178, 182 (partim).

f (a). Mesosternum in both sexes with a wide space between the lobes; its narrowest part in the ♂ 1.5, and in the ♀ 2.5-3 times greater than its length.

g (h). Hind femur in the ♂ with a dark ventral genicular lobe on the outer aspect. Hind tibia in the ♂ with a dark base. Mesosternum in the ♀ with a wide space between the lobes; its narrowest part 2.5 times greater than its length. Length of ♂ 15.5-19.5, ♀ 21.6-28.1 mm; of hind femur ♂ 9.3-11.0, ♀ 11.8-12.9 mm. —Dzungarian Ala Tau . . . . *4d. C. almasyi shnitnikovi B.-Bienko.

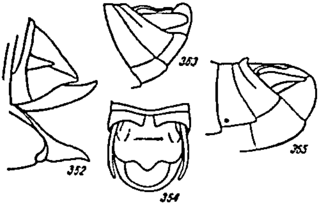
—schnitnikovi Bei-Bienko, 1948, Vestnik AN Kazakhskoi SSR, (seriya zoologicheskaya), 8(41):41, Figure 3.

187 h (g). Hind femur in the ♂ with a light ventral genicular lobe on the outer aspect. Hind tibia in the ♂ with a light base. Mesosternum in the ♀ with a very wide space between the lobes; its narrowest part 3 times greater than its length. Length of ♂ 16.8-18.2, ♀ 21.8-25.8 mm; of hind femur in the ♂ 9.5-11.6, ♀ 11.9-12.5 mm. —Donguztau Range: Karanchi-bulak natural boundary near Lake Son-kul; Dzhitymtau Mts.: Onarch Gorge, Nura mountains in the upper course of the Lesser Naryn River. (Type from Nura Mts.). . . . . *4e. C. almasyi robustum Mistshenko subsp. n.

10 (3). Pronotum in both sexes with a light spot at the ventral margin of the lateral lobes, sometimes all the ventral half of the lobe being light.

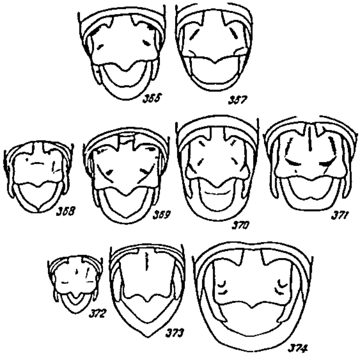
11 (16). Supraanal plate in the ♂ distinctly narrowed toward the apex (Figures 147, 372, 373).

12 (13). Mesosternum in both sexes with a very wide space between the lobes; its narrowest part in the ♂ 2.25, in the ♀ 3 times more than its length. Supraanal plate in the ♂ smooth, its posterior angles widely
188 rounded, not projecting at the sides (Figure 147). Color in the ♀



Figures 362-365
(Original)

362—Conophyma almasyi almasyi (Kuthy), ♀, ovipositor from the side, 363—C. iliense Mistshenko sp. n., ♂, tip of abdomen from the side (type), 364—C. iliense Mistshenko sp. n., ♂, tip of abdomen from above (type), 365—C. leve Mistshenko sp. n., ♂, tip of abdomen from the side (type).



Figures 366-374. Tip of abdomen in ♂ from above. (Original)

366—Conophyma leve Mistshenko sp. n., 367—C. herbaceum Mistshenko sp. n., 368—C. almásyi fragosum Mistshenko subsp. n., 369—C. almásyi rugosum Mistshenko subsp. n., 370—C. almásyi shmtnikovi B.-Bienko; 371—C. almásyi robustum Mistshenko subsp. n., 372—C. mistshenkoi Protz., 373—C. przewalskii B.-Bienko, 374—C. comtulum Mistsh.

dorsally velvet, dull. Length of the ♂ 13.0-15.5, ♀ 15.7-23.5 mm; of hind femur in the ♂ 7.5-9.5, ♀ 9.0-11.5 mm. —Kirghiz mt. range; Dmitrievsk-Pokrovskii, Frunze, Cholok-ter, Kichkin-dol., gorge of River Tuyuk; Trans-Ili Ala Tau; Aman-dzhabiyan, Alma-Ata reserve, gorge of Glubokoe, natural boundary of Kukbel, Dzhure, upper course of the Malaya Almatinka, valley of the Malaya Almatinka, Alma-Ata; Kungei Ala Tau, Ort-koi-su gorge; Dzungarian Ala Tau, environs of Kopal. (Type from gorge of the Tuyuk River) . . . . *5. C. nanum Mistshenko sp. n.

13(12). Mesosternum in both sexes with moderately wide space between the lobes; its narrowest part in the ♂ nearly equal to, in the ♀ 1.75-2.25 times more than its length.

14(15). Lobules of last abdominal tergite in the ♂ pointed. Supraanal plate in the ♂ depressed near the sides of the weakly emarginate margins; its posterior angles distinctly projecting forward and laterad (Figure 372). ♂ cerci black. ♀ abdomen dorsally dull. Length of the ♂ 14.7-16.1, ♀ 19.8-23.4 mm; of hind femur in the ♂ 8.6-9.2, ♀ 10.1-11.3 mm. —Kirghiz mountains . . . *6. C. mistshenkoi Protz.

Protsenko, 1951, Doklady AN SSSR, (novaya seriya), LXXVII, 5:932, Figure 1.

15(14). Lobules of last abdominal tergite in the ♂ rounded. Supraanal plate in the ♂ nearly flat; its lateral margins straight, but its posterior angles not projecting forward and laterad (Figure 373). ♂ cerci slightly darkened. ♀ abdomen dorsally shiny. Length of ♂ 16.1-19.2, ♀ 18.7-25.1 mm; of hind femur ♂ 9.5-11.5, ♀ 11.2-13.1 mm. —Mountains: Kungei Ala Tau, Terskei Ala Tau, Kyuilyutau, Dzhitymtau . . . . *7. C. przewalskii B.-Bienko.

Bei-Bienko, 1949, Entomologicheskoe obozrenie, XXX:319, Figure 2. —semenovi Zubovskii, 1898, Ezhegodnik Zoologicheskogo muzeya AN, III:106 (partly), Jakobson, 1905:202, 303 (partim); Uvarov, 1927a: 178, 182 (partim).

16(11). Supraanal plate in the ♂ distinctly widened at the apex (Figure 374). Length of the ♂ 16.5-20.0, ♀ 19.5-27.5 mm; of hind femur in the ♂ 9.5-11.5, ♀ 10.0-14.5 mm. —Fergana mts.: Kug-art, Sary-bel Pass, Chor-tash Pass, Manageldy River, Kok-kiya River, Uzgen. (Type from Kug-art) . . . . *8. C. comtulum Mistsh.

Mishchenko, 1950, Doklady AN Uzbekskoi SSR, 5:30, Figure 1[1].

17 (2). Hind femora of ♂ with light inner aspect, sometimes faintly greenish in the dorsal part.

18(37). Body in the ♂ dorsally green or olive.

19(30). Supraanal plate in the ♂ smooth, without a triangular tooth raised upward and without transverse pad near the middle of the lateral margins (Figures 375-381).

20(25). Distal end of hind femur, base of hind tibiae, supraanal plate and cerci in the ♂ light.

21(22). Meso-, and metanotum and first abdominal tergite in both sexes

hardly noticeably rugose. Hind femurs in the ♂ with a yellow ventral aspect . . . . *9. C. boldyrevi B.-Bienko.

a (b). Pronotum in the ♂ without white spots near the lateral carinae Mesosternum in the ♀ with moderately wide space between the lobes,
189 its narrowest part twice more than its length. Supraanal plate in the ♂ widened at the apex, *its posterior angles weakly rounded* projecting laterad (Figure 375). Length of ♂ 15.3-15.5, ♀ 18.5-21.5 mm, of hind femur in the ♂ 9.0-9.1, ♀ 10.5-10.7 mm. —Mountain range of Uzunakhmattau (Kirghizia). *9a. C. boldyrevi boldyrevi B.-Bienko.

—boldyrevi Bei-Bienko, 1948, Zapiski Leningradskogo sel'skokhozyaistvennogo Instituta, 5 141.

b (a). Pronotum in the ♂ with white spots near the lateral carinae. Mesosternum in the ♀ with a very wide space between the lobes, its narrowest part is 2.5 times more than its length. Supraanal plate in the ♂ not widened at the apex, its posterior angles widely rounded (Figure 376). Length of ♂ 17.1-21.5, ♀ 21.1-26.1 mm, of hind femur in the ♂ 9.8-10.8, ♀ 11.1-12.0 mm. —Northern part of Chatkal Mts. Aflatun Pass . . . . . . *9b. C boldyrevi angustum Mistshenko subsp. n.

22 (21). Meso-, metanotum, and first abdominal tergite in both sexes distinctly rugose. Hind femur in the ♂ with a red ventral aspect.

190 23 (24). ♀ head large, strongly projecting forward. Hind femora in the ♀ well-proportioned, length of femur 4 times greater than its greatest width. Mesosternum in the ♀ with very wide space between the lobes, its narrowest part 2.5 times more than its length. ♂ unknown. Length of ♀ 19-21, of hind femur 11.0-12.1 mm. —Kashmir . . . . 19. C. kashmiricum Mistsh

Mishchenko, 1950, Doklady AN SSSR, (novaya seriya), LXXII, 1 213, Figure 1[2].

24 (23). Head in both sexes small, moderately projecting forward. Hind femur in the ♀ stout, femurs 3.5 times longer than their greatest width. Mesosternum in the ♀ with moderately wide space between the lobes, its narrowest part twice more than its length Supraanal plate in the ♂ smooth, narrowed apicad, its posterior angles strongly rounded (Figure 377). Length of ♂ 15.0-16.5, ♀ 18.0-21.5 mm, of hind femur in the ♂ 8.5-8.6, ♀ 10.0-10.7 mm. —Kashmir . . . . 11. C. mitchelli Uv.

Uvarov, 1921, Ent. Month. Mag., (3), VII 268, Uvarov, 1925, Journ. Bomb. Nat. Hist. Soc., XXX, 3 552 Uvarov, 1927a 178, 181, Figure 227.

25 (20). Apex of hind femora, base of hind tibiae, supraanal plate and cerci in the ♂ dark.

26 (27). Abdomen in both sexes with a light median carina. Lobules of last abdominal tergite in the ♂ rounded Supraanal plate in the ♂ with broadly rounded posterior angles, angles not projecting laterad (Figure 378). Length of the ♂ 13.0-15.7, ♀ 19.7 mm, of hind femur ♂ 8.4-9.8, ♀ 10.4 mm. —Kashmir. . . . . 12. C. indicum Mistsh.

Mishchenko, 1950, Doklady AN SSSR, (novaya seriya), LXXII, 1 213, Figure 1[3].

27(26). Abdomen in both sexes with a dark median carina. Lobules of last abdominal tergite in the ♂ pointed. Supraanal plate in the ♂ with slightly rounded posterior angles; angles distinctly projecting laterad (Figures 379-381).

28(29). Lobules of last abdominal tergite in the ♂ wide and short, reaching 1/4 to 1/5 of the length of the supraanal plate. Supraanal plate in the ♂ widened at the apex (Figures 379, 380). *13. C. semenovi Zub.

a (b). Vertex in both sexes wide; its width between the eyes in the ♂ twice in the ♀ 2.5 times more than the width of the frontal ridge between the antennae. Lobules of last abdominal tergite in the ♂ reaching 1/5 of the length of the anal plate (Figure 379). Length of ♂ 14.5-17.9, ♀ 18.5-24.7 mm; of hind femur ♂ 9.2-9.9, ♀ 10.5-12.1 mm. — Trans-Ili Ala Tau ....*13a. C. semenovi semenovi Zub.

—semenovi Zubovskii, 1898, Ezhegodnik Zoologicheskogo muzeya AN, III:106 (partim); Jakobson, 1905:202, 303, Figure 35 (partim); Uvarov, 1927a:178, 182 (partim).

b (a). Vertex in both sexes narrower; its width between the eyes in the ♂ 1.5, in the ♀ 2 times more than the width of the frontal ridge between the antennae. Lobules of last abdominal tergite of the ♂ reaching
191 1/4 of the length of the supraanal plate (Figure 380). Length of ♂ 15.8-18.5, ♀ 19.2-25.2 mm; of hind femur ♂ 10.1-10.9, ♀ 12.0-12.4 mm. —Kirghız mts.: valley of the Tuyuk River .... *13b. C. semenovi vestitum Mistshenko subsp. n.

29(28). Lobules of last abdominal tergite in the ♂ narrow and long, reaching 1/3 the length of the anal plate. Supraanal plate in the ♂ not widened at the apex (Figure 381). Length of the ♂ 15.5-19.8, ♀ 19.5-24.5 mm; of hind femur ♂ 9.7-11.1, ♀ 10.1-14.3 mm. —Fergana mts. Sometimes injures young crops and gardens on the slopes of the Fergana Range..............................*14. C. jakovlevi B.-Bienko—Yakovlev's Conophyma [Konofima Yakovleva].

Bei-Bienko, 1936, Ann. Mag. Nat. Hist., (10), XVIII:302, Figure 4.
Biology: Mishchenko, 1949b:165.

30(19). Supraanal plate in the ♂ with a triangular tooth raised a little toward the dorsum (Figure 382) or with a transverse pad in the middle of the lateral margins (Figures 383-385).

31(32). Supraanal plate in the ♂ dark, widened at the apex, with a triangular tooth raised a little toward the dorsum at the middle of the lateral margins (Figure 382). ♂ cerci black. Length of ♂ 17.5-22.1, ♀ 22.9-29.6 mm; hind femur ♂ 10.2-12.4, ♀ 12.7-14.1. —Fergana Mts., Alai valley, Alai and Transalai Mts., northern Pamir; western China· Kashgaria................ *15. C. zubovskii Uv.

—zubovskyi Uvarov, 1925, Journ. Bomb. Nat. Hist. Soc., XXX, 3:551; Uvarov, 1927a:179, 183, Figure 229.

32(31). Supraanal plate in the ♂ light, not widened or narrowed at the apex, with a transverse pad at the middle of the lateral margins (Figures 383-385). ♂ cerci light.

33(34). Lobules of last abdominal tergite in the ♂ small, reaching 1/5 of the length of the supraanal plate (Figure 383). Length of ♂ 13.5-13.8, of ♀ 18.1-24.3 mm; of hind femur ♂ 8.4-8.6, ♀ 9.5-12.0 mm. —Turkestan mt. Range †. . . . . *16. C. bogojavlenskii Tarb.

Tarbinsky, 1926, Ann. Mag. Nat. Hist., (9), XVII 94, Figure 7, Uvarov, 1927a 178, 182, Figure 228.

34(33). Lobules of last abdominal tergite in the ♂ larger, almost reaching 1/3 of the length of the supraanal plate (Figures 384, 385).

35(36). Vertex in the ♂ wide; its width between the eyes twice more than the width of the frontal ridge between the antennae. Pronotum in the ♂ with unicolored lateral lobes; lobes without a light spot at the ventral margin. Subgenital plate in the ♂ with rounded apex (Figure 384). Length of ♂ 15.5, ♀ 21.5-23.5 mm, of hind femur ♂ 9.3, ♀ 11.2-11.3 mm. —Eastern part of Turkestan Range Shchurov glacier . . . . *17. C. egregium Mistsh.

Mishchenko, 1950, Doklady AN SSSR, (novaya seriya), LXXII, 1 213, Figure 1[4].

36(35). Vertex in the ♂ narrower, its width between the eyes 1.5 times greater than the width of the frontal ridge between the antennae Pro-
192 notum in the ♂ with a light spot at the ventral margin of the lateral lobes. Subgenital plate in the ♂ with a pointed apex which is produced in the form of a conical cusp (Figure 385). Length of ♂ 14.8, ♀ 19.5-19.6 mm; of hind femur ♂ 8.6, ♀ 10.3-10.5 mm. —Hissar Mts. near Mur. . . . .*18. C. prasinum Mistsh.

Mishchenko, 1950, Doklady AN Uzbekskoi SSR, 5 30, Figure 1[2].

37(18). Body in the ♂ brown or black dorsally.

38(47). ♂ cerci long, extending far beyond the posterior median process of the supraanal plate. Supraanal plate in the ♂ with a distinct pad or tooth in the middle of the lateral margins (Figures 386-390)

39(42). ♂ cerci distinctly curved inward in the apical part (Figure 386), sometimes slightly curved (Figure 387) then the vertex is wide, its width between the eyes twice more than the width of the frontal ridge between the antennae

40(41). Vertex in the ♂ narrow; its width between the eyes 1.5 times more than the width of the frontal ridge between the antennae Mesosternum in both sexes with fairly wide space between the lobes, its narrowest part in the ♂ hardly greater and in the ♀ 1.5 times greater than its length Supraanal plate in the ♂ with a distinct tooth in the middle of the lateral margins (Figure 386). Length of ♂ 15.2, ♀ 18.3 mm, of hind femur ♂ 9.2, ♀ 9.6 mm. —Hissar Mts. Khodzhi-obi-garm, 50 km north of Stalinabad [Dushambe] . . . . *19. C. armatum Mistsh.

Mishchenko, 1950, Doklady AN SSSR, (novaya seriya), LXXII, 1 213, Figure 1[5].

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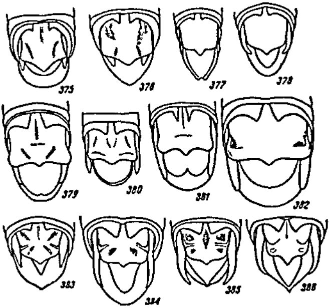
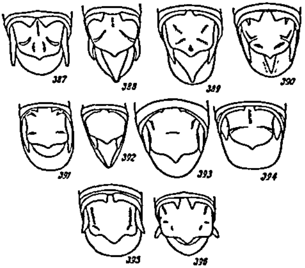
† In describing this species, Tarbinskii (1926, Ann Mag Nat. Hist., (9), XVII 95) wrongly described Lake Kara-Kul-katta, which he calls simple Kara-Kul, as being in Pamir In fact, it lies approximately 30 km southeast of Vorukh village in the region of a small glacier of the Turkestan Mountain Range



Figures 375-386. Tip of abdomen in ♂ from above. (Original)

375—Conophyma boldyrevi boldyrevi B.-Bienko; 376—C. boldyrevi angustum Mistshenko subsp. n.; 377—C. mitchelli Uv.; 378—C. indicum Mistsh.; 379—C. semenovi semenovi Zub.; 380—C. semenovi vestitum Mistshenko subsp. n.; 381—C. jakovlevi B.-Bienko, 382—C. zubovskii Uv.; 383—C. bogojavlenskii Tarb.; 384—C. egregium Mistsh., 385—C. prasinum Mistsh.; 386—C. armatum Mistsh.



Figures 387-396. Tip of abdomen in ♂ from above. (Original)

387—Conophyma badium Mistsh., 388—C. nigrescens Mistsh., 389—C. fuscum Mistsh., 390—C. tumidum Mistsh., 391—C. olsufjevi Mistsh., 392—C. dumale Mistsh.; 393—C. petrosum Mistsh., 394—C. laudanense Mistsh.; 395—C. comatum Mistshenko sp. n., 396—C. saxatile Mistsh.

41(40). Vertex in the ♂ wide; its width between the eyes nearly twice the width of the frontal ridge between the antennae. Mesothorax in both sexes with a wide space between the lobes, its narrowest part in the ♂ 1 5, in the ♀ twice more than its length Supraanal plate in the ♂ with a distinct pad at the middle of the lateral margins (Figure 387). Length of ♂ 19.5, ♀ 19.5-23.6 mm; of hind femur ♂ 9.3, ♀ 10.3-12.0 mm. —Zeravshan Mts.· Matcha Pass . . . . *20. C. badium Mistsh.

Mishchenko, 1950, Doklady AN Uzbekskoi SSR, 5:30, Figure 1[3].

42(39). ♂ cerci straight [sic!] (Figures 388-390). Vertex in the ♂ narrow; its width between the eyes 1.25-1.5 times more than the width of the frontal ridge between the antennae.

43(46). Pronotum in the ♂ with 3 distinct transverse grooves.

44(45). Coloring of body in the ♂ black dorsally. Lobules of last abdominal tergite in the ♂ larger, reaching 1/3 of the length of the supraanal plate (Figure 388). Length of ♂ 13.5-14.9, ♀ 15.5-20.2 mm; of hind femur ♂ 8 4-8 7, ♀ 10.0-10 8 mm —Karateginskie Mts.· mts of Kabudkrym, 9 km south of Garm. . . . . *21. C. nigrescens Mistsh.

Mishchenko, 1950, Doklady AN SSSR, (novaya seriya), LXXII, 1 214, Figure 1[6].

45(44). Coloring of body in the ♂ brown dorsally. Lobules of last abdominal tergite in the ♂ small, reaching 1/5 of the length of the supraanal plate (Figure 389). ♀ unknown. Length of ♂ 14.7, of hind femur 9.3 mm. —Zeravshan Mts Zeravshan glacier, *22. C. fuscum Mistsh.

Mishchenko, 1950, Doklady AN Uzbekskoi SSR, 5 31, Figure 1[4].

46(43). Pronotum in the ♂ with one distinct transverse posterior groove, the 2 anterior grooves hardly perceptible. Length of ♂ 15.5-15.8,
193 ♀ 18.5 mm, of hind femur in the ♂ 9 8-10 1, ♀ 11.4 mm. —Peter the First Range Gardan-i-kaftar. . . . . . *23. C. tumidum Mistsh.

Mishchenko, 1950, Doklady AN SSSR (novaya seriya), LXXII, 1 214, Figure 1[7].

47(38). ♂ cerci short, not reaching or just reaching the apex of the posterior median process of the anal plate (Figures 393-396), sometimes distinctly extending beyond the apex of the supraanal plate, then the anal plate is smooth (Figures 391, 392). Lobules of last tergite of the abdomen in the ♂ small, sometimes hardly perceptible, rounded or slightly pointed (Figures 391-395).

48(57). Lobules of last tergite of the abdomen in the ♂ small, hardly developed (Figures 391-395).

49(52). ♂ cerci distinctly extending beyond the apex of the posterior median process of the supraanal plate (Figures 391, 392)

50(51). Pronotum in the ♂ with 3 distinct transverse grooves Supraanal plate in the ♂ with distinctly laterad-projecting posterior angles (Figure 391) Length of ♂ 13.0-13.6, ♀ 20.0-21.5 mm, of hind femur ♂ 8 5-8 6, ♀ 10.0-10.5 mm. —Hissar Range . . . *24. C. olsufjevi Mistsh

Mistshenko, 1937, Konowia, XVI, 2:130, Figures 1A-B, 2A-B.

51 (50). Pronotum in the ♂ with only the posterior transverse groove distinct; the 2 anterior grooves weak, hardly perceptible. ♂ supraanal plate with broadly rounded angles (Figure 392). Length of ♂ 15.8-17.1, ♀ 19.5-26.1 mm; of hind femur ♂ 9.5-10.1, ♀ 10.9-11.6 mm. —Hissar Range: natural boundary of Ruidasht 40 km north of Stalinabad†. . . . . *25. C. dumale Mistsh.

Mishchenko, 1950, Doklady AN SSSR, (novaya seriya), LXXII, 1:214, Figure 1[8].

52 (49). ♂ cerci far from reaching the apex of the posterior median process of the supraanal plate (Figures 393-395).

53 (56). Body of ♂ with short sparse hairs. Vertex in profile in the ♂ distinctly emarginate in front of the eyes (Figure 397). Eyes in the ♂ large; vertical diameter of the eye equal to the subocular groove (Figure 397). Pronotum in the ♂ with only the posterior transverse groove distinct; the 2 anterior grooves hardly perceptible.

54 (55). Supraanal plate in the ♂ smooth; its posterior angles slightly rounded, but distinctly projecting laterad (Figure 393). Length of body of ♂ 17.4-18.3, ♀ 21.5-24.1 mm; of hind femur ♂ 8.6-9.2, ♀ 10.4-10.8 mm. —Turkestan Mt.Range: Guralash . . . . *26. C. petrosum Mistsh.

Mishchenko, 1950, Doklady AN Uzbekskoi SSR, 5:31, Figure 1[5].

55 (54). Supraanal plate in the ♂ with a short pad in the middle of the lateral margins; its posterior angles broadly founded, not projecting laterad (Figure 394). ♀ unknown. Length of ♂ 16.4, of hind femur 8.9 mm. —Zeravshan Mts.: Laudan . . . . *27. C. laudanense Mistsh.

Mishchenko, 1950, Doklady AN Uzbekskoi SSR, 5:31, Figure 1[6].

56 (53). Body in the ♂ with long dense hairs. Vertex in profile in the ♂ not emarginate in front of the eyes (Figure 398). Eyes in the ♂ small; vertical diameter of the eye distinctly less than the subocular groove
194 (Figure 398). Pronotum in the ♂ with 3 distinct transverse grooves. ♀ unknown. Length of ♂ 15.6, of hind femur 8.9 mm. —Eastern part of Kirghiz Mts.: Shamsi Pass . . . . *28. C. comatum Mistshenko sp. n.

57 (48). Lobules of last tergite of the abdomen in the ♂ rather large, pointed, reaching 1/5 of the length of the supraanal plate (Figure 396). Length of ♂ 15.3-18.1, ♀ 25.0-26.8 mm; of hind femur in the ♂ 8.4-9.2, ♀ 10.4-11.2 mm. —Western slopes of the Fergana Range: Arslanbob . . . . *29. C. saxatile Mistsh.

Mishchenko, 1950, Doklady AN Uzbekskoi SSR, 5:31, Figure 1[7].

58 (1). Body in both sexes always brown or black; abdomen or all the body dorsally with 2 to 3 light longitudinal bands (in some ♀♀ these bands are sometimes obsolescent). ♀ ovipositor usually with a very

† [Now Dushambe.]

distinct tooth (Figure 399) on the outer ventral margin of the ventral valves.

59 (108). ♂ cerci far from reaching the apex of the subgenital plate, but it does reach or barely extends beyond the apex of the posterior median process of the anal plate (Figures 150, 400-435).

195 60 (99). Supraanal plate in the ♂ smooth, without a tooth raised a little upwards or a tubercle in the middle of the lateral margins and without a transverse pad at the posterior angles (Figures 150, 400-429).

61 (70). Pronotum in both sexes with 3 distinct transverse grooves.

62 (63). Lobules of last abdominal tergite in the ♂ contiguous at the base. Subgenital plate in the ♂ with pointed apex which is produced in the form of a carina (Figure 400). ♀ unknown. Length of ♂ 13.8, of hind femur 8.2 mm. —Darvaz Range Poshkharvi . . . . *30. C. argutum Mistsh.

Mishchenko, 1950, Doklady AN SSSR, (novaya seriya), LXXII, 1 214, Figure 19.

63 (62). Lobules of last abdominal tergite in the ♂ separated at the base. Subgenital plate in the ♂ with rounded apex (Figures 401-407).

64 (65). Supraanal plate in the ♂ gradually narrowed toward the apex Lobules of last tergite of the ♂ abdomen nearly quadrate, with rounded apex (Figures 401-403).. . . . . *31. C. pylnovi Uv.

a (d). Ventral aspect of hind femora and hind tibiae in both sexes at least in the apical part, red or carmine-red.

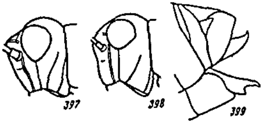
b (c). Pronotum of ♂ with distinct lateral carinae which abruptly converge in the anterior part, lateral lobes with a light spot at the posterior angle. The hind tibiae of the ♂ completely carmine-red. Length of ♂ 12.8-14.3, ♀ 16.4-17.4 mm, of hind femurs ♂ 7.5-8.0, ♀ 9.7-10.0 mm. —Karzhantau Range Ak-tash (southeastern Kazakhstan). . . . . *31a C. pylnovi pylnovi Uv.

—pylnovi Uvarov, 1925, Journ. Bomb. Nat. Hist. Soc, XXX 558 Uvarov, 1927a:181, 187, Figures 245-246.

c (b). Pronotum of ♂ with effaced lateral carinae, which are especially effaced in the posterior part, but weakly converge in the anterior part, all the ventral part of the lateral lobes light. Only the apical part of the hind tibiae in the ♂ red. Length of ♂ 14.2-14.8, ♀ 15.3-19.4 mm, of hind femur ♂ 7.5-8.3, ♀ 8.5-9.6 mm —Kar-
196 zhantau Range upper course of the River Su-singan, Min-bulak (southeastern Kazakhstan). (Type from upper course of the Su-singan) . . . .*31b. C. pylnovi glutum Mistshenko subsp. n.

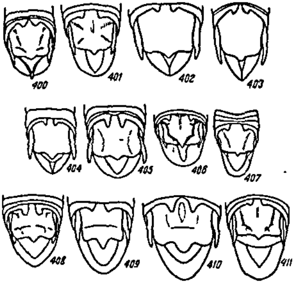
d (a). Ventral aspect of hind femora and hind tibiae in both sexes grayish yellow, sometimes faintly rosy at the distal ends. Length of ♂ 11.4-11.8, ♀ 14.1-15.6 mm, of hind femur ♂ 6.3-6 5, ♀ 7.0-7.4 mm. —Karzhantau Range Uluk-dzhurt meadow, Kish-dzhurit (southeastern Kazakhstan). (Type from Uluk-dzhurt meadow) . . . . *31c. C. pylnovi claripes Mistshenko subsp n.

65 (64). Supraanal plate in the ♂ distinctly widened at the apex Lobules of last abdominal tergite in the ♂ triangular, pointed at the apex (Figures 404-407).



Figures 397-399
(Original)

397—Conophyma laudanense Mistsh., ♂, head from the side; 398—C. comatum Mistshenko sp. n., ♂, ibid, 399—C. pylnovi pylnovi Uv., ♀, ovipositor from the side.



Figures 400-411. Tip of abdomen in ♂ from above.
(Original)

400—Conophyma argutum Mistsh., 401—C. pylnovi pylnovi Uv.; 402—C. pylnovi glutum Mistshenko subsp. n.; 403—C. pylnovi claripes Mistshenko subsp. n., 404—C. xerophilum Mistshenko sp. n.; 405—C. validum Mistsh.; 406—C. plotnikovi plotnikovi Uv.; 407—C. plotnikovi pubescens Mistshenko subsp. n.; 408—C. berezhkovi B.-Bienko, 409—C. maracandicum maracandicum Mistsh., 410—C. maracandicum sordidum Mistsh., 411—C. simile Zub.

66(69). Pro-, meso-, and metanotum in both sexes almost unicolored. Mesosternum in the ♂ with a wide space between the lobes; its narrowest part 1.5 times greater than its length Supraanal plate in the ♂ with a wide posterior median process (Figures 404, 405).

197 67(68). ♂ vertex wide; its width between the eyes 1.75 times more than the width of the frontal ridge between the antennae. Hind tibiae in the ♂ red. Lobules of last abdominal tergite in the ♂ small, hardly reaching 1/6 of the length of the supraanal plate (Figure 404). Length of ♂ 14.8, ♀ 18.3 mm, of hind femur ♂ 8.2, ♀ 8.7 mm. —Karzhantau Range: upper course of the River Su-singan (southeastern Kazakhstan). . . . . *32. C. xerophilum Mistshenko sp. n.

68(67). ♂ vertex narrow; its width between the eyes hardly more than the width of the frontal ridge between the antennae. Hind tibiae in the ♂ yellow. Lobules of last abdominal tergite in the ♂ large, reaching *1/4 the length of the supraanal plate (Figure 405) Length of ♂ 14 2-*15.0, ♀ 18.4 mm, of hind femur ♂ 8.3-9.0, ♀ 10.3 mm. —Darvaz Range· Viskharvi-bole . . . . *33. C. validum Mistsh.

Mishchenko, 1950, Doklady AN SSSR, (novaya seriya), LXXII, 1:215, Figure 1[10].

69(66). Pro-, meso-, and metanotum in both sexes with a distinct yellowish marking. Mesosternum in the ♂ with a narrow space between the lobes; its narrowest part equals its length. Supraanal plate in the ♂ with a narrow posterior median process (Figures 406, 407). . . . . *34. C. plotnikovi Uv.

a (b). Hind femora in both sexes stout; length of femur 3 times greater than its greatest width. Hind tibiae in both sexes reddish at the distal ends. Length of ♂ 12.5-15.0, ♀ 13.5-18.1 mm, of hind femur ♂ 6.8-7.5, ♀ 8.3-8.5 mm. —Pskem Range . . . . *34a. C. plotnikovi plotnikovi Uv.

—plotnikovi Uvarov, 1925, Journ. Bomb. Nat. Hist. Soc., XXX 556, Uvarov, 1927a 181, 187, Figures 247-248.

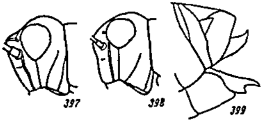
b (a). Hind femora in both sexes slender, length of femur 3.6-3.8 times greater than its greatest width. Hind tibiae in both sexes yellow at the distal ends. Length of body in the ♂ 10.8-12.7, ♀ 12.0-14.1 mm, of hind femur ♂ 7.0-7.6, ♀ 8.2-8.4 mm. —Chatkal Range Idris-paigambar, Bok-tugain. (Type from Idris-paigambar) . . . . *34b. C. plotnikovi pubescens Mistshenko subsp. n.

70(61). Pronotum in both sexes with only the posterior transverse groove distinct, the median groove only sometimes distinct, the anterior groove hardly perceptible or altogether absent.

71(98). Supraanal plate in the ♂ with a narrow triangular pointed median process on the posterior margin (Figures 150, 408-428).

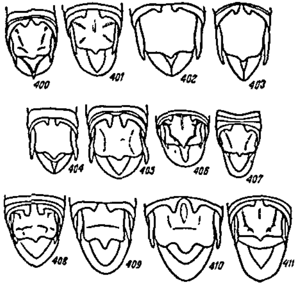
72(81). Pronotum in the ♂ in the anterior part with distinct lateral carinae strongly diverging toward the median carina (Figure 436). Body of the ♂ *dorsally brown*, sometimes black, then the pronotum has no light lateral bands.

73(80). Supraanal plate in the ♂ with broadly rounded posterior angles, its length equal to or distinctly less than its greatest width (Figures 408-412).



Figures 397-399
(Original)

397—Conophyma laudanense Mistsh., ♂, head from the side; 398—C. comatum Mistshenko sp. n., ♂, ibid, 399—C. pylnovi pylnovi Uv., ♀, ovipositor from the side.



Figures 400-411. Tip of abdomen in ♂ from above.
(Original)

400—Conophyma argutum Mistsh.; 401—C. pylnovi pylnovi Uv.; 402—C. pylnovi glutum Mistshenko subsp. n.; 403—C. pylnovi claripes Mistshenko subsp. n.; 404—C. xerophilum Mistshenko sp. n.; 405—C. validum Mistsh.; 406—C. plotnikovi plotnikovi Uv., 407—C. plotnikovi pubescens Mistshenko subsp. n., 408—C. berezhkovi B.-Bienko, 409—C. maracandicum maracandicum Mistsh., 410—C. maracandicum sordidum Mistsh., 411—C. simile Zub.

66(69). Pro-, meso-, and metanotum in both sexes almost unicolored. Mesosternum in the ♂ with a wide space between the lobes; its narrowest part 1.5 times greater than its length. Supraanal plate in the ♂ with a wide posterior median process (Figures 404, 405).

197 67(68). ♂ vertex wide; its width between the eyes 1.75 times more than the width of the frontal ridge between the antennae. Hind tibiae in the ♂ red. Lobules of last abdominal tergite in the ♂ small, hardly reaching 1/6 of the length of the supraanal plate (Figure 404). Length of ♂ 14.8, ♀ 18.3 mm, of hind femur ♂ 8.2, ♀ 8.7 mm. —Karzhantau Range· upper course of the River Su-singan (southeastern Kazakhstan). . . . . *32. C. xerophilum *Mistshenko sp. n.*

68(67). ♂ vertex narrow; its width between the eyes hardly more than the width of the frontal ridge between the antennae. Hind tibiae in the ♂ yellow. Lobules of last abdominal tergite in the ♂ large, reaching 1/4 the length of the supraanal plate (Figure 405) Length of ♂ 14 2-15.0, ♀ 18.4 mm; of hind femur ♂ 8.3-9.0, ♀ 10.3 mm. —Darvaz Range· Viskharvi-bole . . . . *33. C. validum Mistsh.

Mishchenko, 1950, Doklady AN SSSR, (novaya seriya), LXXII, 1:215, Figure 1[10].

69(66). Pro-, meso-, and metanotum in both sexes with a distinct yellowish marking. Mesosternum in the ♂ with a narrow space between the lobes; its narrowest part equals its length. Supraanal plate in the ♂ with a narrow posterior median process (Figures 406, 407). . . . . *34. C. plotnikovi Uv.

a (b). Hind femora in both sexes stout, length of femur 3 times greater than its greatest width. Hind tibiae in both sexes reddish at the distal ends. Length of ♂ 12.5-15.0, ♀ 13.5-18.1 mm, of hind femur ♂ 6.8-7.5, ♀ 8.3-8.5 mm. —Pskem Range . . . . *34a. C. plotnikovi plotnikovi Uv.

—plotnikovi Uvarov, 1925, Journ. Bomb. Nat. Hist. Soc., XXX·556, Uvarov, 1927a 181, 187, Figures 247-248.

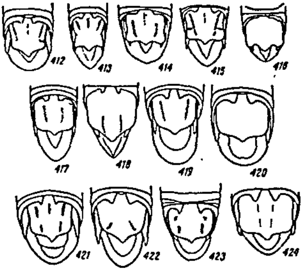
b (a). Hind femora in both sexes slender, length of femur 3.6-3.8 times greater than its greatest width. Hind tibiae in both sexes yellow at the distal ends. Length of body in the ♂ 10.8-12.7, ♀ 12.0-14.1 mm, of hind femur ♂ 7.0-7.6, ♀ 8.2-8.4 mm. —Chatkal Range Idris-paigambar, Bok-tugain. (Type from Idris-paigambar) . . . . *34b. C. plotnikovi pubescens *Mistshenko subsp. n.*

70(61). Pronotum in both sexes with only the posterior transverse groove distinct, the median groove only sometimes distinct, the anterior groove hardly perceptible or altogether absent.

71(98). Supraanal plate in the ♂ with a narrow triangular pointed median process on the posterior margin (Figures 150, 408-428).

72(81). Pronotum in the ♂ in the anterior part with distinct lateral carinae strongly diverging toward the median carina (Figure 436). Body of the ♂ dorsally brown, sometimes black, then the pronotum has no light lateral bands.

73(80). Supraanal plate in the ♂ with broadly rounded posterior angles, its length equal to or distinctly less than its greatest width (Figures 408-412).



Figures 412-424. Tip of abdomen in ♂ from above (Original)

412—*Conophyma geminum* Mistsh.; 413—*C. kuznetzovi* Um.; 414—*C. bey-bienkoi* Mistsh.; 415—*C. uvarovi uvarovi* Sem.; 416—*C. uvarovi vicinum* Mistsh.; 417—*C. sokolovi sokolovi* Zub.; 418—*C. sokolovi decorum* Mistshenko subsp. n.; 419—*C. sokolovi obscurum* Mistshenko subsp. n.; 420—*C. sokolovi modestum* Mistsh.; 421—*C. jacobsoni jacobsoni* Uv.; 422—*C. jacobsoni vastum* Mistsh.; 423—*C. jacobsoni obnoxium* Mistsh.; 424—*C. jacobsoni carinatum* Mistsh.

74(79). Pronotum in the ♂ dorsally unicolored, without light lateral bands. Supraanal plate in the ♂ either the same width at the apex as at the base (Figures 409, 410) or distinctly widened toward the apex (Figures 408, 411).

75(76). Lobules of last abdominal tergite in the ♂ large, nearly right-angled,
198 not narrowed toward the apex, reaching 1/4 the length of the supraanal plate (Figure 408). Length of ♂ 13.0-13.2, ♀ 16.0-17.7 mm; of hind femur ♂ 8.0-8.1, ♀ 9.5-9.7 mm. —Turkestan Range Isfara . . . .*35. C. berezhkovi B.-Bienko.

Bei-Bienko, 1948, Zapiski Leningradskogo sel'skokhozyaistvennogo Instituta, S 142, Figure 12a.

76(75). Lobules of last abdominal tergite in the ♂ small, triangular, distinctly narrowed toward the apex, reaching 1/7 to 1/6 of the length of the supraanal plate (Figures 409-411).

77(78). Supraanal plate in the ♂ quadrate, its posterior angles distinctly projecting forward, its length equal to its greatest width. ♂ cerci reaching only the apex of the posterior median process of the anal plate (Figures 409, 410) . . . . . . *36. C maracandicum Mistsh.

a (b). Pronotum in the ♂ with entire lateral carinae behind the anterior transverse groove. Hind tibiae yellow in both sexes. Length of ♂ 14.8-15.5, ♀ 18.4-19.3 mm, of hind femur ♂ 7.8-8.4, ♀ 9.0-9.5 mm. —Zeravshan Range Andar . . . .*36a. C. maracandicum maracandicum Mistsh.

—maracandicum Mishchenko, 1950, Doklady AN Uzbekskoi SSR, S 31, Figure 1[8].

b (a). Pronotum in the ♂ with interrupted lateral carinae behind the anterior transverse groove. Hind tibiae in both sexes orange in the distal part. Length of ♂ 13.7-15.8, ♀ 17.2-19.7 mm, of hind femur ♂ 7.3-8.3, ♀ 8.3-9.9 mm. —Turkestan Range Guralash. . . . . *36b. C. maracandicum sordidum Mistsh.

Mishchenko, 1950, Doklady AN Uzbekskoi SSR, S 31, Figure 1[9].

78(77). Supraanal plate in the ♂ trapezoidal, its posterior angles not projecting forward at all, its length distinctly less than its greatest width. ♂ cerci distinctly extending beyond the apex of the posterior median process of the supraanal plate (Figure 411) ♀ unknown Length of ♂ 13.5-14.2, of hind femur 7.9-8.1 mm. —Western part of Turkestan Range Obi-kamali River. . . . . . . *37. C. simile Zub.

Zubovskii, 1899, Trudy Russkogo entomologicheskogo obshchestva, XXXII:591 Jakobson, 1905 202, 305, Uvarov, 1927a:181, 186, Figures 243-244.

79(74). Pronotum in the ♂ dorsally with light lateral bands Supraanal plate in the ♂ narrowed toward the apex (Figure 412). Length of the ♂ 13.2, ♀ 17.6-19.8 mm, of hind femur ♂ 7.5, ♀ 9.4-9.7 mm. —Darvaz Range· Gushkhon . . . .*38. C. geminum Mistsh

Mishchenko, 1950, Doklady AN SSSR, (novaya seriya), LXXII, 1:215, Figure 1[11].

80(73). Supraanal plate in the ♂ with almost pointed posterior angles; its length distinctly greater than its greatest width (Figure 413). Length of ♂ 9.4-10.9, ♀ 11.6-15.2 mm; of hind femur ♂ 6.2-6.8, ♀ 8.0-8.4 mm. —Alai, Trans-Alai mt. ranges and the valley of Alai. . . . . *39. C. kuznetzovi Um.

—kusnezovi Umnov, 1931, Ent. Nachrichtenblatt, V:15; Mistshenko, 1937, Ann. Mag. Nat. Hist., (10), XX:91. —birulai Miram, 1931, Trudy Pamirskoi ekspeditsii, Zoologiya, VIII:70, Figures 1A-D.

199 81(72). Pronotum of the ♂ in the anterior part either with nearly parallel lateral carinae, or very slightly convergent toward the median carina (Figure 437), then the body is shiny black dorsally and the pronotum has distinct light lateral bands.

82(83). Body in the ♀ light-brown, almost no black marking. Mesosternum in the ♀ with a wide space between the lobes; its narrowest part is 2.25 times greater than its length. The ♂ is unknown. Length of ♀ 14.3, of hind femur in the ♀ 8.4 mm. —Sarykol Range (northeastern Pamir) . . . . *40. C. reinigi (Rme.)

Ramme, 1930, Mitt. Zool. Mus. Berlin, XVI:214, Figures 2-3, tab. I, Figure 5 (Pamiracris).

83(82). Body in both sexes with a distinct black marking, sometimes the black marking is faint, then the mesosternum has a fairly wide space between the lobes; its narrowest part equal to or 1.5 times greater than its length.

84(97). Pronotum in the ♂ with a light spot at the ventral margin of the lateral lobes. ♂ cerci straight or curved inward (Figures 150, 414-427).

200 85(96). Supraanal plate in the ♂ narrowed toward the apex, sometimes widened at the apex or quadrate (Figures 150, 414-425), then the body is brown dorsally. ♀ ovipositor with a sharp tooth in front of the apex on the outer ventral margin of the ventral valves (Figure 438).

86(95). Lobules of last abdominal tergite in the ♂ widely-spaced (Figures 150, 414-424).

87(92). Lobules of last abdominal tergite in the ♂ either distinct, apically rounded (Figures 415, 417-520), or hardly perceptible, nearly absent (Figures 414, 416).

88(91). Pronotum in the ♂ dorsally without light lateral bands, sometimes with them, then the width of the vertex between the eyes is hardly greater than the width of the frontal ridge between the antennae. Supraanal plate in the ♂ with distinctly laterad-projecting or forward-projecting posterior angles (Figures 414-416).

89(90). Vertex in the ♂ wide; its width between the eyes nearly twice more than the width of the frontal ridge between the antennae. Hind tibiae in both sexes with orange distal part. Lobules of last abdominal tergite in the ♂ very small, nearly absent (Figure 414). Length of ♂ 12.8-14.0, ♀ 15.5-19.8 mm; of hind femur ♂ 6.5-7.8, ♀ 8.2-9.0 mm. —Northern spur of the Hindu Kush (northern Afghanistan). . . . . 41. C. bey-bienkoi Mistsh.

Mistshenko, 1937, Journ. Bomb. Nat. Hist. Soc., XXXIX:806, Figures 4A-E.

90(89). Vertex in the ♂ usually narrow; its width between the eyes hardly greater than the width of the frontal ridge between the antennae, sometimes nearly twice greater than it, then the lobules of the last abdominal tergite are distinct, reaching 1/8 of the greatest length of the supraanal plate (Figure 415). Hind tibiae in both sexes yellow or gray. . . . . *42. C. uvarovi Sem.

a (b). ♂ vertex wide; its width between the eyes nearly twice the width of the frontal ridge between the antennae. Pronotum in the ♂ dorsally unicolored, without light lateral bands. Mesosternum in the ♀ with a wide space between the lobes; its narrowest part twice its length. Length of the ♂ 12.0-14.1, ♀ 16.4-17.1 mm, of hind femur ♂ 7.1-7.5, ♀ 8.5-9 0 mm. —Eastern part of the Kopet Dag Range . . . . *42a. C. uvarovi uvarovi Sem.

—uvarovi Semenov-Tyan-Shanskii, 1915, Russkoe entomologicheskoe obozrenie, XV 453, Uvarov, 1927a 180, 186, Figures 241-242.

b (a). ♂ vertex narrow; it width between the eyes hardly greater than the width of the frontal ridge between the antennae Pronotum in the ♂ dorsally with light lateral bands. Mesosternum in the ♀ with fairly wide space between the lobes; its narrowest part 1.5 times greater than its length Length of the ♂ 11 8-12 4, ♀ 18 4-19.1 mm; of hind femur ♂ 7.1-7.2, ♀ 8 0-8.5 mm. —Central part of the Kopet Dag Range Chapan and Shakh-Shakh mountains . . . . *42b. C. uvarovi vicinum Mistsh.

Mishchenko, 1950, Doklady AN SSSR, (novaya seriya), LXXII, 1:215, Figure 1[12].

91(88). Pronotum in the ♂ always with light lateral bands dorsally. ♂ vertex wide, its width between the eyes 2 - 3 times greater than *the width of the frontal ridge between the antennae. Supraanal plate in* the ♂ with posterior angles not projecting to the sides at all (Figures 417-420). . . . . *43. C. sokolovi Zub.

201 a (b). Mesosternum in the ♂ with a narrow space between the lobes; its narrowest part slightly less than its length. Supraanal plate in the ♂ nearly quadrate (Figure 417). Length of ♂ 11.5-16.5, ♀ 14.2-19.5 mm; of hind femur ♂ 7.2-8.9, ♀ 8.0-10.4 mm. —Spurs of Tashkent Ala Tau and adjacent lowlands Keles, Belyakovka, Nikol'skoe, Cossack villages, Tashkent, Vrevskaya Cossack village . . . . *43a. C. sokolovi sokolovi Zub.

—sokolowi Zubovskii, 1899, Trudy Russkogo entomologicheskogo obshchestva, XXXII:588, Jakobson, 1905 202, 304, Uvarov, 1927a:180, 186, Figures 239-240 (partim)

b (a). Mesosternum in the ♂ with moderately wide space between the lobes; its narrowest part 1.25-1.5 *times greater* than its length. Supraanal plate in the ♂ either narrowed toward the apex (Figures 418, 419) or almost rectangular (Figure 420).

c (f). Pronotum in the ♂ in the anterior part with lateral carinae weakly converging toward the median carina or concave. Supraanal plate in

the ♂ narrowed toward the apex; its posterior angles greater than 90° (Figures 418, 419).

d (e). Pronotum in the ♂ with entire lateral carinae which are not interrupted near the median transverse groove. ♂ cerci not reaching the apex of the supraanal plate (Figure 418). Length of the ♂ 12.6-13.7, ♀ 14.2-15.3 mm; of hind femur ♂ 7.1-8.4, ♀ 8.9-9.4 mm. —Karatau Range (southeastern Kazakhstan): Burnoe, mts. of Kazak-bulak; Kirghiz mts.: Frunze, Makbalskaya Gap, Taldy-bulak; Trans-Ili Ala Tau: Syugatinskoe gorge, Alma Range: Pokrovka; Talass Ala Tau: villages of Kazanskoe and Klyuchevka. (Type from Pokrovka) . . . . *43b. C. sokolovi decorum Mistshenko subsp. n.

—sokolowi Uvarov, 1927a:180, 186 (partim).

e (d). Pronotum in the ♂ with the lateral carinae distinctly interrupted near the median at transverse groove. ♂ cerci reach or extend beyond the posterior median process of the supraanal plate (Figure 419). Length of ♂ 14.2, ♀ 19.7 mm; of hind femur ♂ 8.8, ♀ 10.9 mm. — Dzhitymtau Range (Kirghizia): environs of Naryn . . . . *43c. C. sokolovi obscurum Mistshenko subsp. n.

f (c). Pronotum in the ♂ in the anterior part with straight parallel lateral carinae. Supraanal plate in the ♂ nearly rectangular, its posterior angles nearly equal to 90° (Figure 420). Length of the ♂ 13.5-14.0, ♀ 17.5-19.5 mm; of hind femur ♂ 7.8-8.0, ♀ 9.0-9.5 mm. —Southeastern part of Nura Tau Range: Tungunbulak of Dzhizak region. . . . . *43d. C. sokolovi modestum Mistsh.

Mishchenko, 1950, Doklady AN Uzbekskoi SSR, 5 31, Figure 1[10].

92 (87). Lobules of last abdominal tergite in the ♂ always distinct, always pointed on the apex (Figures 150, 421-424).

93 (94). Lobules of last abdominal tergite in the ♂ small, reaching 1/5 to 1/6 of the length of the supraanal plate (Figures 421-424) . . *44. C. jacobsoni Uv. —Jakobson's Conophyma [Konofima Jakobsona].

a (f). Pronotum in both sexes with distinct transverse grooves; median groove always crosses the lateral carinae.

b (e). Mesosternum in both sexes with fairly wide space between the lobes;
202 its narrowest part in the ♂ equal to, in the ♀ 1.5 times its greatest width. Length of supraanal plate in ♂ equal to its greatest width. (Figures 421, 422).

c (d). Hind femora in both sexes yellow in the dorsal part of the inner aspect. Lobules of last abdominal tergite in the ♂ reaching 1/6 of the length of the supraanal plate. ♂ cerci almost reaching the apex of the posterior median process of the supraanal plate (Figure 421). Length of ♂ 13.4-16.2, ♀ 18.2-23.0 mm; of hind femur ♂ 8.0-8.5, ♀ 9.0-10.2 mm. — Pskem Range (southeastern Kazakhstan). Injures cereal grasses. . . . . *44a. C. jacobsoni jacobsoni Uv. —Jakobson's Conophyma [Konofima Jakobsona].

—jacobsoni Uvarov, 1925, Journ. Bomb. Nat. Hist. Soc., XXX:554 (partim); Uvarov, 1927a:180, 185, Figures 237-238 (partim).

Biology: Mishchenko, 1949b:164.

d (c). Hind femora in both sexes dark in the dorsal part of the inner aspect. Lobes of last abdominal tergite in the ♂ reaching 1/5 the length of the supraanal plate. ♂ cerci extending beyond the apex of the posterior median process of the supraanal plate (Figure 422) Length of ♂ 14.5-14.8, ♀ 20.5-22.5 mm; of hind femur ♂ 8.5-9.5, ♀ 11.5-11.8 mm. —Western spur of the Fergana Range· mts. of Bau-bash-ata (Chervak). Injures young crops of cereal grasses. . . . . *44b. C. jacobsoni vastum Mistsh. —Kirghiz Conophyma [Konofima Kirgizskaya].

Mishchenko, 1950, Doklady AN SSSR, (novaya seriya), LXXI, 4:791, Figure 1[2]. —jacobsoni Uvarov, 1925, Journ. Bomb. Nat. Hist. Soc., XXX 554 (partim), Uvarov, 1927a 180, 185 (partim)

Biology Bei-Bienko, 1932b 29 (partim); Predtechenskii, Zhdanov and Popova, 1935 87, 129 (partim), Mishchenko, 1949b 165.

e (b). Mesosternum in both sexes with a wide space between the lobes; its narrowest part in the ♂ 1.5, in the ♀ 1.75 times greater than its length Length of supraanal plate of ♂ considerably less than its greatest width (Figure 423). Length of ♂ 12.1-13.5, ♀ 13.6-19.5 mm, of hind femur ♂ 7.6-9.1, ♀ 8.2-10.4 mm. —Chatkal and Kuramin mt ranges Sometimes injures young crops of cereal grasses . . . . *44c. C. jacobsoni obnoxium Mistsh —Noxious Conophyma [Konofima vrednaya]

Mishchenko, 1950, Doklady AN SSSR, (novaya seriya), LXXI, 4 791, Figure 1[3]

Biology: Bei-Bienko, 1932b:29 (partim), Predtechenskii, Zhdanov and Popova, 1935 87, 129 (partim) Mishchenko, 1949b:164

f (a). Pronotum in both sexes with only the posterior transverse groove distinct, the other grooves hardly perceptible, nearly absent, median groove not crossing the lateral carinae. Length of ♂ 12.7-13.6, ♀ 15.6-19.7 mm, of hind femur ♂ 7.5-7.7, ♀ 8.3-9.5 mm. —Northern slopes of Turkestan Range Guralash Reserve . . . . *44d. C. jacobsoni carinatum Mistsh.

Mishchenko, 1950, Doklady AN Uzbekskoi SSR, 5:33, Figure 1[11].

94 (93). Lobules of last abdominal tergite in the ♂ large, reaching 1/3 the length of the supraanal plate (Figure 150) Length of ♂ 12 3-12.9, ♀ 14 4-16.1 mm, of hind femur ♂ 8.0-8.3, ♀ 8.5-9.9 mm —Chatkal Range village of Ortotokoi. . . . . . . *45. C. nitens Mistshenko sp. n.

203 95 (86). Lobules of last abdominal tergite in the ♂ very slightly separated at the base; space between them very narrow, right angled (Figure 425). Length of ♂ 14.9, ♀ 15.1 mm, of hind femur ♂ 9, ♀ 10 mm. —Chatkal Range Pasha-ata . . . . *46. C. virgatum Mistshenko sp. n.

96 (85). Supraanal plate in the ♂ rectangular, sometimes barely widened at the apex (Figures 426, 427). Body of ♂ dorsally always shiny black. ♀ ovipositor without a distinct tooth in front of the tip (Figure 439) on the outer ventral margin of the ventral valves . . . . *47. C. dirshi B.-Bienko

a (b). Mesosternum in the ♂ with a narrow space between the lobes; its narrowest part slightly less than its length. Lobules of last abdominal tergite in the ♂ with pointed apices (Figure 426). Length of ♂ 14.3-14.5, ♀ 18.5 mm; of hind femur ♂ 8.7-9.5, ♀ 10.9 mm. — Uzun-akhmattau Range (northern Kirghizia): upper course of the Dzhelanda River. . . . . *47a. C. dirshi dirshi B.-Bienko.

—dirshi Bei-Bienko, 1948, Zapiski Leningradskogo sel'skokhozyaistvennogo instituta, 5:143.

b (a). Mesosternum in the ♂ with a wide space between the lobes; its narrowest part 1.5 times greater than its length. Lobules of last abdominal tergite in the ♂ with a rounded apex (Figure 427). Length of the ♂ 14.5-15.8, ♀ 18.5-22.5 mm; of hind femur ♂ 8.8-9.1, ♀ 9.9-11.0 mm. —Chatkal Range: banks of Lake Sary-chilek, Aflatun, near Lake Ir-kul. (Type from Lake Sary-chilek). . . . . *47b. C. dirshi procerum Mistshenko subsp. n.

97 (84). Pronotum in the ♂ without a light spot near the ventral margin of the lateral lobes. ♂ cerci turned outward (Figure 428). The ♀ is unknown. Length of ♂ 13.5; of hind femur 8.2 mm. —Turkestan Range (?). . . . . *48. C. septuosum Mistsh.

Mishchenko, 1950, Doklady AN Uzbekskoi, SSR, 5:33, Figure 1[12].;

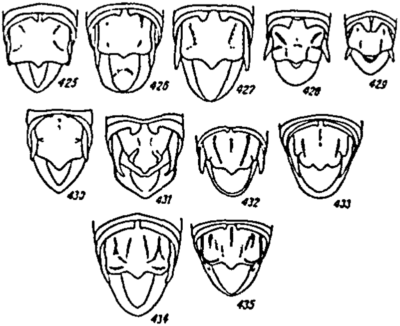
98 (71). Supraanal plate in the ♂ with a very wide rounded median process on the posterior margin (Figure 429). Length of the ♂ 11.8-13.5, ♀ 15.7-16.5 mm; of hind femur ♂ 7.4-8.5, ♀ 8.6-9.1 mm. —Western part of Zeravshan Range: Sarkhok-dara River, Urgut . . . . *49. C. weberi Zub.

Zubovskii, 1899, Trudy Russkogo entomologicheskogo obshchestva, XXXII:584, Jakobson, 1905:202, 304, Uvarov, 1927a:179, 184, Figures 233-234.

99 (60). Supraanal plate in the ♂ with a blunt tubercle or tooth raised a little upwards, and sometimes with a transverse elevated pad at the middle of the lateral margins or at the posterior margin (Figures 430-435).

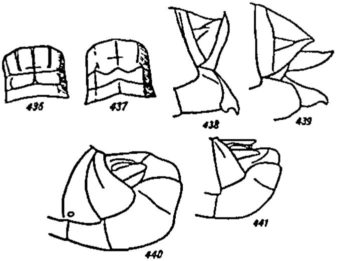
100 (101). Vertex in both sexes moderately wide; its width between the eyes in the ♂ slightly, in the ♀ twice more than the width of the frontal ridge between the antennae. Mesothorax in both sexes with a wide space between the lobes; its narrowest part in the ♂ 1.5, in the ♀ 2.5 times greater than its length. Supraanal plate in the ♂ with a blunt tubercle raised a little upwards at the middle of the lateral margins (Figure 430). Length of ♂ 11.4-14.8, ♀ 14.7-21.6 mm;
204 of hind femur in the ♂ 6.5-8.4, ♀ 8.0-10.4 mm. —Alai Range: Karashagol . . . . *50. C. alajense Mistshenko sp. n.

101 (100). Vertex in both sexes wide; its width between the eyes in the ♂ 2-3, in the ♀ 2.5 times greater than the width of the frontal ridge between the antennae. Mesosternum in both sexes with a fairly wide space between the lobes; its narrowest part in the ♂ less than or equal to its length, in the ♀ it is 1.5 to twice greater than



Figures 425–435. Tip of abdomen in ♂ from above. (Original)

425—Conophyma virgatum Mistshenko sp. n., 426—C. dirshi dirshi B.-Bienko, 427—C. dirshi procerum Mistshenko subsp. n., 428—C. septuosum Mistsh., 429—C. weberi Zub., 430—C. alajense Mistshenko sp. n. (type), 431—C. susinganicum Mistshenko sp. n., 432—C. miramae miramae Uv., 433—C. miramae lepidum Mistshenko subsp. n., 434—C. formosum Mistshenko sp. n., 435—C. speciosum Mistshenko sp. n.



Figures 436–441
(Original)

436—Conophyma berezhkovi B.-Bienko, ♂, pronotum from above, 437—C. nitens Mistshenko sp. n., ♂, ibid., 438—C. sokolovi sokolovi Zub., ♀, ovipositor from the side, 439—C. dirshi procerum Mistshenko subsp. n., ♀, ibid., 440—C. formosum Mistshenko sp. n., ♂, tip of abdomen from the side, 441—C. speciosum Mistshenko sp. n., ♂, ibid.

it. Supraanal plate of the with a tooth raised a little upwards of with a transverse elevated pad at the middle of the lateral margins or even at the posterior margin (Figures 431-435).

102(103). Supraanal plate in the ♂ triangular. Lobules of last abdominal tergite in the ♂ large, reaching 1/6 of the length of the supraanal plate (Figure 431). Length of ♂ 10.8-12.2, ♀ 14.2-14.8 mm; of hind femur ♂ 7.4-7.6, ♀ 8.4-8.8 mm. —Karzhantau Range (southeastern Kazakhstan): Lake Susingan. . . . . *51. C. susinganicum Mistshenko sp. n.

103(102). Supraanal plate in the ♂ trapezoidal or nearly rectangular. Lobules of last abdominal tergite in the ♂ small, hardly perceptible (Figures 432-435).

05 104(105). Supraanal plate in the ♂ with a tooth raised a little upwards, near the middle of the lateral margins (Figures 432, 433) . . . . *52. C. miramae Uv.

a (b). Ventral aspect of hind femur, apex and base of hind tibia, in both sexes, orange or orange-red. Supraanal plate in the with posterior angles not projecting forward. ♂ cerci reaching the apex of the posterior median process of the supraanal plate (Figure 432). Length of ♂ 11.3-15.5, ♀ 14.2-18.8 mm; of hind femur ♂ 7.3-8.2, ♀ 8.2-9.1 mm. —Western part of Kirghiz Range . . . . *52a. C. miramae miramae Uv.

—miramae Uvarov, 1925, Journ. Bomb. Nat. Hist. Soc., XXX:553, Uvarov, 1927a:180, 185, Figures 235, 236.

b (a). Ventral aspect of hind femur, apex and base of hind tibia in both sexes bright red. Supraanal plate in the ♂ with the posterior angles distinctly projecting forward. ♂ cerci extending beyond the apex of the posterior median process of the supraanal plate (Figure 433). Length of ♂ 11.7-13.5, ♀ 13.9-19.5 mm; of hind femur ♂ 7.8-8.5, ♀ 9.2-9.8 mm. —Eastern part of Kirghiz Range: Makbal and Chai-sandyk. (Type from Makbal Pass) . . . . *52b. C. miramae lepidum Mistshenko subsp. n.

—miramae Miram, 1931, Trudy Paminskoi ekspeditsii, Zoologiya, VIII:73, Figures 3A-B (nec Uvarov).

105(104). Supraanal plate in the ♂ with a sharp elevated transverse pad at the posterior angles (Figures 434, 435).

206 106(107). Pronotum in the ♂ long; its lateral lobes right-angled. Hind tibiae in the ♂ yellow. ♂ cerci in profile wide, hardly narrowed toward the apex (Figure 440). ♀ unknown. Length of ♂ 15.5, of hind femur in the ♂ 9.7 mm. —Chatkal Range valley of the Chatkal River (Bok-tugain). *53. C. formosum Mistshenko sp. n.

107(106). Pronotum of the ♂ short; its lateral lobes nearly quadrate. Hind tibiae in both sexes bright red. ♂ cerci in profile narrow, conical (Figure 441). Length of ♂ 14, ♀ 17.9 mm; of hind femur ♂ 8.1, ♀ 9.8 mm. —Pskem Range· source of the River Chimganka . . . . *54. C. speciosum Mistshenko sp. n.

108 (59). ♂ cerci extending far beyond the subgenital plate or nearly reaching its apex, then always extending far beyond the apex of the

of the posterior median process of the supraanal plate (Figures 442-446).

109(110). Supraanal plate in the ♂ with a triangular tooth raised a little upward in the middle of the lateral margins (Figure 442). ♂ cerci only reaching the apex of the subgenital plate, in profile straight cone-like (Figure 457). Length of ♂ 13.0-14.8, ♀ 15.5-18.5 mm, of hind femur ♂ 7-8, ♀ 7.6-9.0 mm. —Northern spurs of the Hindu Kush (northern Afghanistan) . . . . 55. C. predtetshenskii Mistsh.

—predtetshenskyi Mistshenko, 1937, Journ. Bomb. Nat. Hist. Soc., XXXIX:804, Figures 3A-E.

110(109). Supraanal plate in the ♂ smooth (Figures 443-445, 447-456), sometimes with an indistinct tubercle in the middle of the lateral margins (Figure 446), then the cerci are sinuous at the apex, bent sharply ventrad (Figure 458).

111(120). ♂ cerci only reaching the apex of the subgenital plate (Figures 443-449).

207 112(115). Lobules of last abdominal tergite in the ♂ large, reaching 1/4 to 1/3 the length of the supraanal plate (Figures 443-445)

113(114). Lobules of last abdominal tergite in the ♂ widely spaced, apically rounded (Figure 443). Hind tibiae in both sexes bright red. Length of ♂ 13.5-15.8, ♀ 16.5-19.5 mm, of hind femur ♂ 8.7-10.0, ♀ 10-11 mm. —Darvaz Range· Saryzakhbursi and Sagyrdasht . . . . *56. C. darvazicum Mistsh.

Mishchenko, 1950, Doklady AN SSSR, (novaya seriya), LXXII, 1:215, Figure 1[13].

114(113). Lobules of last abdominal tergite in the ♂ slightly spaced, nearly contiguous at the base, pointed (Figures 444, 445). Hind tibiae in the ♂ yellow, in the ♀ reddish or orange at the apex. . . . . *57. C. mirabile Mistsh

a (b). Lobules of last abdominal tergite in the nearly reaching 1/3 of the length of the supraanal plate. Supraanal plate of the slightly widened toward the apex, its greatest width distinctly greater than its narrowest part [sic!] (Figure 444). Length of ♂ 14.6-15.1, ♀ 19.6 mm; of hind femur ♂ 9.0-9.1, ♀ 10.4 mm. —Turkestan Range Kul' and Guralash natural boundaries of Zaamin District in Uzbekistan (Type from Guralash natural boundary) . . . . *57a. C. mirabile mirabile Mistsh.

—mirabile Mishchenko, 1950, Doklady AN Uzbekskoi SSR, 5:33, Figure 1[13].

b (a). Lobes of last abdominal tergite in the ♂ reaching almost 1/4 of the length of the supraanal plate Supraanal plate in the ♂ not widened apically, its greatest width equal to its narrowest part (Figure 445). Length of ♂ 15.1-15.4, ♀ 18.3-19.7 mm, of hind femur ♂ 8.7-8.9, ♀ 9.6-10.4 mm —Zeravshan Range Zauron village, Andar in Pendzhikent District of Tadzhikistan (Type from

Andar) . . . . *57b. C. mirabile coruscum Mistsh.

Mishchenko, 1950, Doklady AN Uzbekskoi SSR, 5:33, Figure 1[14].

115(112). Lobules of last abdominal tergite in the ♂ very small, hardly reaching 1/7 of the length of the supraanal plate, sometimes entirely absent (Figures 446-449).

116(117). ♂ cerci in the apical part curved at both sides, bent sharply ventrad almost at an angle of 90° (Figure 458) . . . . *58. C. umnovi B.-Bienko–Umnov's Conophyma [Konofima Umnova].

a (b). Pronotum in the ♂ with nearly right-angled lateral lobes. Anal plate in the ♂ with a blunt elevated tubercle at the middle of the lateral margins (Figure 446). Length of ♂ 14.5-17.1, ♀ 16.5-22.5 mm; of hind femur ♂ 8.3-9.1, ♀ 9.5-10.7 mm. —Northwestern and western slopes of the Hissar Range: Tengi-khoram, Kara-dagan [hamlet or grazing range], Kzyl-tam, Khan-takhta natural boundary. In years of en masse reproduction injurious to bogar crops . . . . . . *58a. C. umnovi umnovi B.-Bienko.

—umnovi Bei-Bienko, 1948, Lapiski Leningradskogo sel'skokhozyaistvennogo Instituta, Zoologiya, 5: 145, Figure 12B. —guzaricum Umnov (in litt.).

Biology:—guzaricum Bei-Bienko, 1932b 28.—Conophyma sp. Predtechenskii, Zhdanov and Popova, 1935.87.—insigne insigne Mishchenko, 1949b:164.

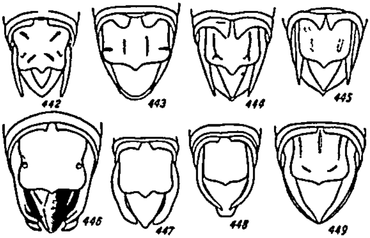
b (a). Pronotum in the ♂ with nearly quadrate lateral lobes. Supraanal plate of the ♂ smooth (Figure 447). Length of ♂ 11.3-13.1, ♀
208 14.5-15.6 mm; of hind femur ♂ 7.4-8.1, ♀ 8.3-8.7 mm. —Southern slopes of western part of the Hissar Range: Darai-nikhan, Chashaibi Hissar. (Type from Darai-nikhan) . . . . *58b. C. umnovi parvum Mistsh.

Mishchenko, 1950, Doklady AN Uzbekskoi SSR, 5:33, Figure 1[15].

117(116). ♂ cerci in the apical part bent evenly ventrad, smooth (Figure 459, 460).

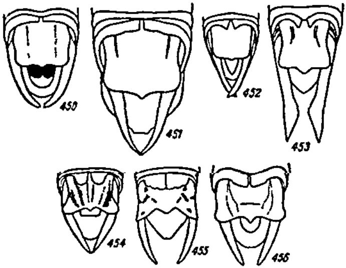
118(119). Vertex in the ♂ moderately wide, its width between the eyes 1.5 times greater than the width of the frontal ridge between the antennae. Lobules of last abdominal tergite in the ♂ triangular, reaching nearly 1/7 of the length of the supraanal plate. Supraanal plate in the ♂ distinctly narrowed at the base; its lateral margins weakly convex, nearly straight. Subgenital plate in the ♂ with the apex produced in the form of a blunt cusp (Figure 448). Length of ♂ 11.5-12.9, ♀ 14.5-15.5 mm; of hind femur ♂ 6.4-7.0, ♀ 8.2-8.8 mm. —Kugitang Range: Sary-disar natural boundary. . . . . *59. C. zimini B.-Bienko.

Bei-Bienko, 1948, Zapiski Leningradskogo sel'skokhozyaistvennogo instituta, 5:144, Figure 12b.



Figures 442-449. Tip of abdomen in ♂ from above. (Original)

442—*Conophyma predtetshenskii* Mistsh., 443—*C. darvazicum* Mistsh., 444—*C. mirabile mirabile* Mistsh., 445—*C. mirabile coruscum* Mistsh., 446—*C. umnovi umnovi* B.-Bienko; 447—*C. umnovi parvum* Mistsh., 448—*C. zimini* B.-Bienko, 449—*C. bactrianum* Mistsh.



Figures 450-456. Tip of abdomen in ♂ from above. (Original)

450—*Conophyma tarbinskii* Mir., 451—*C. sogdianum* Mistsh., 452—*C. turcomanum* Mistsh.; 453—*C. ikonnikovi* Uv., 454—*C. exellens* Mistsh., 455—*C. lobulatum* Mistsh.; 456—*C. splendidum* Mistsh.

119(118). ♂ vertex wide; its width between the eyes twice the width of the frontal lobe between the antennae. Last tergite of the abdomen in the ♂ without lobules. Supraanal plate in the ♂ widened at the base; its lateral margins distinctly concave. Subgenital plate of ♂ with rounded apex (Figure 449). Length of ♂ 14.0-15.3, ♀ 18.0-20.4 mm; of hind femur ♂ 7.9-8.8, ♀ 10.0-10.2 mm. —Southeastern slopes of Kugitang Range. . . . .*60. C. bactrianum Mistsh.

Mishchenko, 1950, Doklady AN Uzbekskoi SSR, 5:33, Figure 1[1].

120(111). ♂ cerci extending far beyond the apex of the subgenital plate (Figures 450-456).

121(128). Lobules of last abdominal tergite in the ♂ pointed, sometimes entirely absent. Supraanal plate of ♂ with the median triangular process of the posterior margin projecting forward more strongly than its posterior angles (Figures 450-453).

122(127). ♂ cerci curved inward, gradually narrowed toward the apex, not swollen before the apex (Figures 450-452); in profile they are roundly curved ventrad (Figures 461-463).

123(126). Last abdominal tergite in the ♂ without lobes on the posterior margin. Supraanal plate in the ♂ distinctly widened at the apex (Figures 450, 451).

124(125). ♂ cerci in profile very strongly narrowed toward the apex, in the apical part sharply and strongly curved ventrad (Figure 461). Length of ♂ 11.9-13.5, ♀ 15.5-20.6mm; of hind femur ♂ 7.3-7.8, ♀ 8.7-9.4 mm. —Southwestern part of Hissar Range, gorge near Zera-bulak Cossack village and village of Derbent. . . . .*61. C. tarbinskii Mir.

—tarbinskyi Miram, 1931, Trudy Pamirskoi ekspeditsii, Zoologiya, VIII:71, Figures 2A-E.

125(124). ♂ cerci in profile slightly narrowed toward the apex, in the apical part gradually and slightly bent ventrad (Figure 462). Length of ♂ 15.7-17.8, ♀ 19.0-22.4 mm; of hind femur ♂ 8.0-9.6, ♀ 10.7-11.2 mm. —Western spurs of Zeravshan Range:

209 Tokhtakaracha, Kara-tyube, Kesmen, Anchat-kutan. (Type from Tokhtakaracha) . . . . . .*62. C. sogdianum Mistsh.

Mishchenko, 1950, Doklady AN Uzbekskoi SSR, 5:33, Figure 1[7].

126(123). Lobules of last abdominal tergite in the triangular pointed, reaching nearly 1/4 the length of the supraanal plate. Supraanal plate in

210 the ♂ distinctly narrowed toward the apex (Figure 452). Length of ♂ 11.0-11.2, ♀ 15.0-15.1 mm; of hind femur ♂ 6.6-6.8, ♀ 7.6-8.1 mm. —Eastern part of Kopet Dag Range: Kheirabad . . . .*63. C. turcomanum Mistsh.

Mishchenko, 1950, Doklady AN SSSR (novaya seriya), LXXII, 1:215, Figure 1[4]. —cheirabadicum Umnov, 1931, Ent. Nachrichtenblatt, V.16 (in litt.).

127(122). ♂ cerci straight, on the inner aspect in front of the pointed apex, swollen (Figure 453); in profile straight, not curved ventrad (Figure 464). Length of ♂ 12.7-16.1, ♀ 14.2-18.7 mm; of hind femur ♂ 7.8-9.6, ♀ 8.9-10.2 mm. —Darvaz Range: Sagyrdasht and Sary-sakh-bursi and village of Tovil-dara. Injures young crops on the slopes of the Darvaz Range. *64. C. ikonnikovi Uv. —Ikonnikov's Conophyma [Konofima Ikonnikova].

Uvarov, 1925, Journ. Bomb. Nat. Hist. Soc., XXX:559, Uvarov, 1927a 179, 183, Figures 231-232. Biology· Mishchenko, 1949b 164.

128(121). Lobules of last abdominal tergite in the ♂ large, rounded. Supraanal plate in the ♂ with the median triangular process of the posterior margin projecting forward less than its posterior angles (Figures 454, 455); sometimes the median process only reaches its posterior margin (Figure 456).

129(130). Lobules of last abdominal tergite in the ♂ distinctly separated. Supraanal plate of ♂ with emarginate lateral margins (Figure 454). ♀ ovipositor with a sharp tooth on the outer ventral margin of the ventral valves. Length of ♂ 15.3-16.4, ♀ 18.1 mm, of hind femur ♂ 9.6-10.2, ♀ 10.3 mm. —Peter the First Range: village Damou and environs of Garm. *65. C. excellens Mistsh.

Mishchenko, 1950, Doklady AN SSSR, (novaya seriya), LXXII, 1:215, Figure 1[15].

130(129). Lobules of last abdominal tergite in the ♂ contiguous. Supraanal plate of the ♂ with nearly straight lateral margins (Figures 455, 456). ♀ ovipositor with nearly smooth outer ventral margin of the ventral valves, sometimes it has only a few small denticles.

131(132). Pronotum in the ♀ with a distinct median carina and distinct lateral carinae. Lobules of last abdominal tergite in the ♂ reaching almost 1/3 the length of the supraanal plate. Supraanal plate in the ♂ with pointed posterior angles (Figure 455). Length of ♂ 15.9-16.1, ♀ 18.5-20.0 mm; of hind femur ♂ 9.5-9.6, ♀ 10.5-11.2 mm. —Peter the First Range· Zeri-zamin plateau . . . . *66. C. lobulatum Mistsh.

Mishchenko, 1950, Doklady AN SSSR, (novaya seriya), LXXII, 1.215, Figure 1[16].

132(131). Pronotum in the with effaced median carina and effaced lateral carinae. Lobules of last abdominal tergite in the ♀ reaching 1/4 the length of the supraanal plate. Supraanal plate of the ♂ with rounded posterior angles (Figure 456). Length of body of ♂ 14.4, ♀ 19.5 mm; of hind femur ♂ 9.4, ♀ 11.4 mm. —Darvaz Range Obi-garm Region. Slightly injures cereal grasses. . . . . *67. C. splendidum Mistsh.

Mishchenko, 1950, Doklady AN SSSR, (novaya seriya), LXXI, 4 791, Figure 1[4].

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22. Genus Tarbinskia Mistsh.

Mishchenko, 1950, Doklady AN SSSR, (novaya seriya), LXXI, 4:791.
Type genus: Tarbinskia kittaryi Tarb.

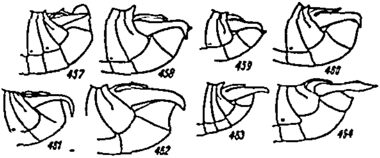
Body completely apterous. Foveolae indistinct. Eyes rather large; vertical diameter of eye in the ♂ slightly larger than the subocular groove, in the ♀ it is equal to it. Pronotum with a low linear median carina. Middle femora of the ♂ very greatly thickened. Hind femora with rounded ventral genicular lobe. Hind tibiae with an external apical spine on the dorsal aspect and with 9-10 spines on the outer margin; the spines of the ventral part of the tibia short, weakly projecting outwards. Prosternal process conical. Tympanic organ on the first abdominal tergite absent. Last abdominal tergite in the ♂ medially split. ♂ cerci (in top view) short, stout, not laterally compressed, in the ♀ stout, though tapered toward the apex, the apex itself is produced and projects outward; length of ♀ cercus in profile equal to its greatest width. Supraanal plate in the ♂ narrow and long; its greatest length nearly 1.5 times greater than its greatest width. Epiphallus in the ♂ elongated; its greatest width 2/3 its length. ♀ ovipositor with dorsal valves tapered toward the tip, these almost equal to the ventral valves; dorso-external margin of dorsal valves entire, without median notch.

Two species known, living in the mountains of southern Tadzhikistan and northern Afghanistan.

1 (2). Antennae stout, in the ♂ just reaching, but in the ♀ not quite reaching the posterior margin of the pronotum. Pronotum in both sexes dorsally with 2 light longitudinal bands. Mesosternum in both sexes with a narrow space between the lobes; its narrowest part in the ♂ nearly 5 times less, in the ♀ 1.25 times greater than its length. Supraanal plate of the ♂ elongated; its greatest width 2/3 its length (Figure 465). Length of ♂ 16.5-19.8, ♀ 18.5-20.5 mm; of hind femur ♂ 10.4-10.7, ♀ 11.8-12.5 mm. —Southern Tadzhikistan mountain ranges: Kara-tau and Gazy-Malek. Pest of bogar wheat in southern Tadzhikistan . . . . *1. T. kittaryi (Tarb.)—Kittary's 'young mare' grasshopper [Kobylka Kittary].

Tarbinsky, 1931, Ent. Anz., XI, 23:459, Figures 1-2 (Conophyma).
Biology: Mishchenko, 1949b:165 (Conophyma).

2 (1). Antennae more slender, in the ♂ extending beyond the posterior margin of the pronotum, in the ♀ reaching it. Pronotum in both sexes dorsally unicolored, without light longitudinal bands. Mesosternum in both sexes with wider space between the lobes; its narrowest part in the ♂ one half, but in the ♀ 1.5 times, its length. Supraanal plate in the ♂ less elongated; its greatest width slightly less than its length (Figure 152). Length ♂ 16.3-19.5, ♀ 17.8-23.5 mm; of hind
212 femur ♂ 7.6-10.2, ♀ 8.5-10.5 mm. —Northern Afghanistan, northern spurs of the Hindu Kush. Pest of bogar crops in the mountains of northern Afghanistan . . . . 2. T. cognata Mistsh.



Figures 457-464. Tip of abdomen in ♂ from the side. (Original)

457—*Conophyma predtetshenskii* Mistsh., 458—*C. umnovi umnovi* B.-Bienko, 459—*C. zimini* B.-Bienko, 460—*C. bactrianum* Mistsh., 461—*C. tarbinskii* Mir., 462—*C. sogdianum* Mistsh., 463—*C. turcomanum* Mistsh., 464—*C. ikonnikovi* Uv.

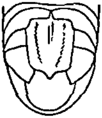


Figure 465. *Tarbinskia kittaryi* (Tarb.), ♂, tip of abdomen from above. (Original)

Mishchenko, 1950, Doklady AN SSSR, (novaya seriya), LXXI, 4:791, Figures 15-6. —kittaryi Mishchenko, 1937, Journ. Bomb. Nat. Hist. Soc., XXXIX 808, Figures 5A-5B (Conophyma) (not Tarbinskii).
Biology: Mishchenko, 1949b·165 (Conophyma).

23. Genus Plotnikovia Um.

Umnov, 1930, Ent. Nachrichtenblatt, III:72.

Body completely apterous. No foveolae. Eyes small; vertical diameter of the eye in both sexes considerably *less than the subocular groove.* Pronotum with a low linear carina. Middle femur in the ♂ slightly thickened. Hind femur with a rounded ventral genicular lobe. Hind tibiae usually without an outer apical spine on the dorsal aspect, very rarely with such a *spine and with* 6-7 spines along the outer margin; the spines of the inner [or ventral] part of the tibia short, weakly projecting outward. Prosternal process conical. Tympanic organ absent on the first abdominal tergite. Last abdominal tergite in the ♂ medially split. Cerci in both sexes laterally compressed, cone-like. Supraanal plate in the ♂ nearly quadrate. ♀ ovipositor with dorsal valves tapered toward the tip, these nearly equal to the ventral valves; dorso-external margin of dorsal valves entire, without median notch.

Only 1 species known from the mountains of southern Kirghizia.

1(1). Vertex in both sexes very wide; its width between the eyes 2.5-2.75 times greater than the width of the frontal ridge between the antennae. Mesosternum in both sexes with a very wide space between the lobes; its narrowest part in the ♂ 3 times, in the ♀ 4 times greater than its length. Lobules of last abdominal tergite in the ♂ small, triangular, nearly reaching 1/8 of the length of the supraanal plate (Figure 466). ♀ ovipositor with an indistinct tooth on the ventro-external margin of the ventral valve. Length of ♂ 14.5-15.5, ♀ 19.5-22.5 *mm;* of hind femur ♂ 7.2-8.3, ♀ 8.7-9.9 mm. —Alai and Trans-Alai ranges, and the Alai valley. (Figure 466). . . . . *1. P. lanigera Um.

Umnov, 1930, Ent. Nachrichtenblatt, III:73.

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24. Genus Pachypodisma Dov.-Zap.

Dovnar-Zapol'skii, 1933:254, 259, 263, 268, Tarbinskii, 1940:21, 149, 153, Mishchenko, 1950a:175.
Type of genus: Pachypodisma lezgina (Uv.).

Body completely apterous. Eyes nearly round; vertical diameter of the eye nearly equal to the horizontal diameter and considerably less than the subocular groove. Antennae short, not reaching the posterior margin of the pronotum. Pronotum in the anterior part very slightly punctate, nearly smooth; the length of its anterior part 1.25-2 *times greater than that of its* posterior part. Hind femur with a smooth dorsal carina. Hind tibia on the dorsal aspect without an external apical spine. Prosternal process straight conical. Mesosternum in both sexes with a wide space between the lobes;

its narrowest part in the ♂ 1,5, in the ♀ 3 times greater than its length. Tympanic organ absent on the first abdominal tergite. Subgenital plate in the ♂ with rounded apex. ♀ ovipositor without teeth on the tip of the valves.

Two species known from the mountains of the Caucasus.

1(2). ♂ vertex wide, its width between the eyes 1.5 times greater than the width of the frontal ridge between the antennae. Pronotum in both sexes with a long anterior part; its length 1.75-twice greater than the length of the posterior part of the pronotum. Hind femur in both sexes slender; length of femur 4 times greater than its greatest width. Metasternum in the ♂ with slightly separated lobes, moderately wide; its greatest width nearly equal to the length of the meso- and metasternum together. Length of ♂ 14.3-18.0, ♀ 19.6-26.3 mm; of hind femur ♂ 9.1-10.5, ♀ 10.4-12.2 mm. —Southwestern Dagestan, northeastern Georgia, Mt. Khochaldag. (Figure 467). . . . . *1. P. lezgina (Uv.)
Wingless 'young mare' grasshopper [Kobylka beskrylaya lezginskaya].

Uvarov, 1917, Izvestiya Kavkazskogo muzeya, XI:283, Figure 1 (Podisma) (partim), Dovnar-Zapol'skii, 1933.254, 268 (partim), Tarbinskii, 1940 21, 153, Figure 134 (partim), Mishchenko, 1950a:176, 177.

2(1). ♂ vertex very wide, its width between the eyes twice greater than the width of the frontal ridge between the antennae. Pronotum in both sexes with the anterior part shorter, its length 1.25-1.5 times greater than the length of the posterior part of the pronotum. Hind femur in both sexes stouter, length of femur 3.3-3.5 times greater than its
214 greatest width. ♂ metasternum with widely spaced lobes, very wide, its greatest width considerably greater than the length of the meso- and metasternum together. Length of ♂ 13.9-16.5, ♀ 17.4-24.5 mm, of hind femur ♂ 8.9-9.3, ♀ 9.5-10.5 mm. —Southeastern Dagestan Mt. Shalbuz-dag and Mt. Kurush, northern Azerbaijan Mt. Shakh-dag . . . . *2. P. crassa Mistsh.

Mishchenko, 1950a 177, 178.—lezgina Uvarov, 1917, Izvestiya Kavkazskogo muzeya, XI 283 (Podisma) (partim), Dovnar-Zapol'skii, 1933 254, 268 (partim), Tarbinskii, 1940 21, 153 (partim)

25. Genus Cophopodisma Dov.-Zap.

Dovnar-Zapol'skii, 1933.256, 259, 268.—Podisma Jakobson, 1905:173, 203, 309 (partly), Chopard, 1922:170 (partly).—Gomphopodisma Dovnar-Zapol'skii, 1933 263.

Type of genus Cophopodisma pyrenaea (Fisch.), Pyrenees

Body completely apterous. Eyes irregularly oval, vertical diameter of the eye hardly greater than its horizontal diameter and nearly equal to the subocular groove. Antennae short, hardly reaching the posterior margin of the pronotum. Pronotum with coarsely, deeply punctate and weakly rugose anterior part, the length of its anterior part 1.75-twice greater than that of the posterior part. Hind femur with a smooth dorsal carina. Hind tibia dorsally without external apical spine. Prosternal process straight,

cone-like. Mesothorax in both sexes with a moderately wide space between the lobes; its narrowest part in the ♂ nearly equal to its length, in the ♀ 1.5 times greater than that. Abdomen with a very small tympanic organ on the first tergite. Subgenital plate of the ♂ with a rounded apex. ♀ ovipositor without teeth on the tip of the valves.

Five species known, living in the mountains of southwestern Europe and Asia Minor.

1 (1). Vertex in the ♀ projecting far forward, shining, deeply depressed [sic]. Pronotum in the ♀ with a very short, widely expanded posterior part; anterior part smooth; posterior part of pronotum and its lateral lobes distinctly tuberculose. Hind femur in the ♀ internally with a bright-red inner carina on the ventral aspect. Hind tibiae in the ♀ red. ♂ unknown. The ♀ is 23 mm long; hind femur 11.5 mm long. —Asia Minor: Anatolia (According to Ramme)............ .... 1. C. natoliae Rme.

Ramme, 1939, Mitt. Zool. Mus. Berlin, XXIV:143, Figure 56.

26. Genus Zubovskia Dov.-Zap.

—Podisma Jakobson, 1905:173, 203, 309 (partim); Berezhkov, 1937:33, 49 (partim). —Zubovskya Dovnar-Zapol'skii, 1933:255, 258, 262, 267; Miram, 1933:40, 42; Chang, 1940:40, 56; Tarbinskii, 1948: 109, 110.

Type of genus: Zubovskia parvula (Ikonn.).

Body completely apterous. Eyes short-oval; vertical diameter of the eyes hardly greater than its horizontal diameter and nearly equal to the subocular groove. Antennae long, extending far beyond the posterior margin of the pronotum. Pronotum with a long anterior part; the length of the anterior part 2.25-3.25 times greater than the length of its posterior part. Hind femur with smooth dorsal carinae. Hind tibiae dorsally without an
215 external apical spine. Prosternal process straight, cone-like. Abdomen with a hardly perceptible tympanic organ on the first tergite. Subgenital plate in the ♂ with apex produced in the form of a cone. ♀ ovipositor with 2 teeth on the tip of the valves.

Three species known, living in eastern Asia.

1 (4). Pronotum in both sexes with moderately long anterior part; the length of its anterior part 2.25-2.5 times greater than that of the posterior part. ♂ cerci slightly extending beyond the apex of the supraanal plate, slightly curved inward (Figures 167, 468).

2 (3). ♂ antennae very slender and long, reaching the base of the hind femora. Hind femur in both sexes long, narrow; length of femur 5.5-6.2 times greater than its greatest width. Length of ♂ 16.7-18.5, ♀ 22.5-23.6 mm; of hind femur ♂ 7.8-11.2, ♀ 11.5-13.6 mm. —Maritime Territory, southern Sakhalin; North China: Manchuria. (Figure 470) ....*1. Z. parvula (Ikonn.)

Ikonnikov, 1911, Ezhegodnik Zoologicheskogo muzeya AN, XVI:260, plate V, Figure 3 (Podisma); Dovnar-Zapol'skii, 1933:255, 256, 261, 267, Figure 5 (Zubovskya), Chang, 1940:58, 59, tab. III, Figure 13 (Zubovskya).

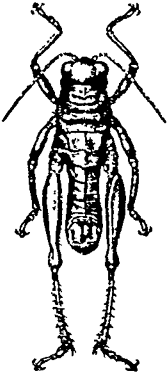

Figure 466. Plotnikovia lanigera Um., ♂ (Original)

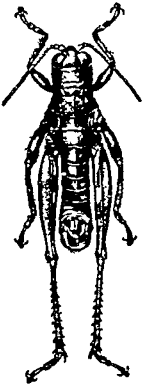

Figure 467. Pachypodisma lezgina (Uv.), ♂. (Original)

Figures 468, 469. Tip of abdomen in ♂ from above. (Original)

3(2). ♂ antennae stouter and short, far from reaching the base of the hind femora. Hind femora in both sexes short and stouter; length of femur 4.6-5.2 times greater than its greatest width. Length of ♂ 12.5-18.4, ♀ 14.5-23.4 mm; of hind femur ♂ 7.5-9.8, ♀ 9.2-12.5 mm. —South Siberia (from Altai to Maritime Territory), Sakhalin; northern Mongolia, North China: Manchuria; Korea. . . . .*2. Z. koeppeni (Zub.)—Keppen's 'young mare' grasshopper [Kobylka Keppena].

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Zubovskii, 1899-1900, Trudy Russkogo entomologicheskogo obshchestva, XXXIV:20 (Podisma); Jakobson, 1905:203, 310 (Podisma); Dovnar-Zapol'skii, 1933:255, 261, 267 (Zubovskya), Miram, 1933:42 (Zubovskya), Berezhkov, 1937:50, 72 (Podisma); Chang, 1940.59, tab. III, Figure 16 (Zubovskya), Tarbinskii, 1948.110 (Zubovskya).

4(1). Pronotum in the ♂ with a very long anterior part, the length of its anterior part 3.25 times greater than the length of its posterior part. ♂ cerci far from reaching the apex of the supraanal plate, strongly curved inward (Figure 469). ♀ unknown. Length of ♂ 24.2, of hind femur 11.8 mm. —North Korea . . . . .3. Z. morii (B.-Bienko).

Bey-Bienko, 1931, Bol. Soc. Esp. Hist. Nat., XXXI 676, Figures 1-2 (Podisma), Dovnar-Zapol'skii, 1933:255, 261, 267 (Zubovskya).

27. Genus Micropodisma Dov.-Zap.

Dovnar-Zapol'skii, 1933:255, 258, 262, 265, Tarbinskii, 1940:21, 149, Tarbinskii, 1948:109, 110, Mishchenko, 1950a:175, 179.—Podisma Jakobson, 1905:173, 203, •309 (partim).—Odontopodisma Dovnar-Zapol'skii, 1933:255, 258, 262, 265 (partim); Tarbinskii, 1948 109 (partim).—Pseudoprumna Dovnar-Zapol'skii, 1933:255, 258, 262, 265.

Type of genus: Micropodisma koenigi (Burr).

Body completely apterous. Eyes irregularly oval; vertical diameter of the eye hardly greater than its horizontal diameter and slightly greater than the subocular groove. Pronotum with a long anterior part; the length of its anterior part 2-3 times greater than the length of its posterior part. Hind femur with a smooth dorsal carina. Hind tibia dorsally without an external apical spine. Prosternal process straight, conical. Tympanic organ on the first abdominal tergite large, well developed. ♀ ovipositor without teeth on the tip of the valves.

Four species known, living in the mountains of the Caucasus, western Europe, and in the northeastern part of Asia Minor.

1(2). Vertex in both sexes narrow, its width between the eyes nearly equal to the width of the frontal ridge between the antennae. Lobules of the last abdominal tergite in the ♂ small, slightly projecting forward, rounded, contiguous at the base. Supraanal plate in the ♂ triangular, with 2 short longitudinal pads at the apex and with 3 longitudinal depressions; the lateral margins slightly emarginate in the middle. ♂ cerci cone-like; pointed. Length of ♂ 13.6-16.0, ♀ 18.5-23.6 mm; of hind femur ♂ 8.0-9.2, ♀ 10.2-12.0 mm. —Krasnodar Territory, Kislovodsk, Georgia; northeastern Turkey. . *1. M. koenigi (Burr).

Burr, 1913, Izvestiya Kavkazskogo muzeya, VII:178, plate VII Figures 4-6 (Podisma) Dovnar-Zapol'-skii, 1933:255, 260, 265, Tarbinskii, 1940:21, Tarbinskii, 1948:110, Mishchenko, 1950a:181.

2(1). Vertex in the ♀ wide; its width between the eye 1.5 times greater than the width of the frontal ridge between the antennae. ♂ unknown. Length of ♀ 19.5-20.0 mm; of hind femur ♀ 11.0-11.4 mm. —Northeastern Georgia, Svanetia· Lebarde .... *2. M. svanetica Dov.-Zap.

Dovnar-Zapol'skii, 1933 255, 260, 265, 266, Tarbinskii, 1940:21, Tarbinskii, 1948:110 Mishchenko, 1950a:181, 182.

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28. Genus Odontopodisma Dov.-Zap

Dovnar-Zapol'skii, 1933 255, 258, 262, 265 (partim), Tarbinskii, 1948:109 (partly) —Podisma Jakobson, 1905 173, 203, 309 (partim), Uvarov, 1925c 86, 88 (partim), Obenberger, 1926 64, 95 (partim).

Eyes nearly round, vertical diameter of the eye nearly equal to its horizontal diameter and nearly equal to the subocular groove. Pronotum almost without a median carina in its anterior part, the length of its anterior part 2.75 times greater than the length of its posterior part near the median carina, no lateral carinae, posterior margin distinctly triangularly emarginate. Tegmina lateral, lobe-like, greatly shortened, concealing the tympanic organ. Wings hardly perceptible Hind femur with a smooth dorsal carina. Hind tibia dorsally without external apical spine Prosternal process conical. First abdominal tergite with a large tympanic organ. Subgenital plate in the ♂ with bluntly conical apex. ♀ ovipositor with 2 teeth on the tip of the valves.

Only 1 species is known, divided into 2 subspecies and distributed in the mountains of western Europe and the southeastern part of the U.S.S R

1(1). Vertex in both sexes narrow, its width in the ♂ between the eyes nearly equal to, and in the ♀ 1.25 times greater than, the width of the frontal ridge between the antennae. Mesosternum in both sexes with moderately wide space between the lobes, its narrowest part in the ♂ hardly greater, in the ♀ 1.5 times greater than its length. Supraanal plate in the ♂ trapezoidal, narrowed toward the apex. ♂ cerci cone-like, bent ventrad .. .. *1. O schmidti (Fieb)

a(b). Hind tibiae dark bluish-green. Hind tarsus greenish or yellow-green. Length of ♂ 13.5-17 1, ♀ 17 5-25.0 mm, of tegmina ♂ 2 0-3.2, ♀ 2.5-4 1 mm —Western Ukraine, Moldavia, southeastern part of western Europe. In western Europe it injures various cultivated plants (Figure 471) .... *1a. O schmidti schmidti (Fieb.)

—schmidtii Fieber, 1853, Lotos, III 119 (Podisma) —schmidti Jakobson, 1905 204, 312 (Podisma) (partim) Uvarov, 1925c 89 (Podisma) (partim); Obenberger, 1926:96, tab. III, Figures 135, 143, 155 (Podisma), Dovnar-Zapol'skii, 1933 255, 260, 265 (partim), —mendax Fischer, 1853, Orth. eur. 371, tab. XV, Figures 23, 23a, 23b (Pezotettix) Brunner-Wattenwyl, 1882 223, 227 (Pezotettix) Jakobson, 1905, plate VII (Pezotettix)

Biology: Bei-Bienko, 1932b 31.

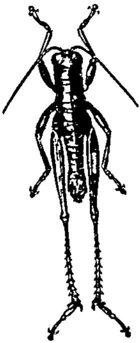


Figure 470. Zubovskia parvula (Ikonn.), ♂. (Original)

Figure 471. Odontopodisma schmidti schmidti (Fieb.), ♂. (Original)

b(a). Hind tibia meat-red at the apex. Hind tarsus meat-red. Length of
218 ♂ 13.5-17.1, ♀ 17.5-25.0 mm; of tegmina ♂ 2.0-3.2, ♀ 2.5-4.1 mm
—Romania . . . . 1b. O. schmidti rubripes (Rme.)

Ramme, 1931, Mitt. Zool. Mus. Berlin, XVII 197 (Podisma).—schmidti Jakobson, 1905 204, 312 (Podisma, partim); Uvarov, 1925c·89 (Podisma, partim); Dovnar-Zapol'skii, 1933 255, 260, 265 (partim)

29. Genus Anapodisma Dov.-Zap.

Dovnar-Zapol'skii, 1933.256, 257, 264.

Eyes short-oval, vertical diameter of the eye slightly greater than its horizontal diameter and nearly equal to the subocular groove. Pronotum with a weak median carina in the anterior part, the length of its anterior part in the ♂ 3 times, in the ♀ 2.5 times greater than that of its posterior part at the median carina, no lateral carinae, posterior margin distinctly triangularly emarginate. Tegmina lateral, lobe-like, greatly shortened, not reaching the tympanic organ. Wings hardly perceptible. Hind femur with a smooth dorsal carina. Hind tibia dorsally without an external apical spine. Prosternal process conical. First abdominal tergite with well developed tympanic organ. Subgenital plate in the ♂ cone-like, with distinctly produced pointed apex. ♀ ovipositor with 2 teeth on the tip of the valves.

Only 1 species is known, living in the Maritime Territory and in Korea.

1(1). Vertex in both sexes moderately wide, its width in the ♂ between the eyes nearly equal to, and in the ♀ 1.5 times greater than the width of the frontal ridge between the antennae. Mesosternum in both sexes with moderately wide space between the lobes, its narrowest part in the ♂ nearly equal to, in the ♀ 1.5 times greater than its length Supraanal plate in the ♂ triangular. Cerci in the ♂ short, straight, cone-like, Length of ♂ 20, ♀ 26.7-28.8 mm, of tegmina ♂ 1.5, ♀ 1 9-2.1 mm — South Maritime Territory, Pogranichnaya [Suifenho] Station, Korea . . . . *1. A. miramae Dov.-Zap.

Dovnar-Zapol'skii, 1933,256, 264.—dairisama Ikonnikov, 1913, Über die von P. Schmidt aus Korea mitgebrachten Acridiodeen 20 (not Scudder) (Podisma).

30. Genus Cophoprumna Dov.-Zap.

Dovnar-Zapol'skii, 1933:256, 259, 263, 267.

Pronotum in the ♂ greatly expanded caudad, with emarginate posterior margin Tegmina in the ♂ small, very short. Tympanic organ in the ♂ small. Posterior margin of the last abdominal tergite in the ♂ without lobes Supraanal plate in the ♂ triangular. ♂ cerci flattened at the apex. Subgenital plate in the ♂ in profile distinctly larger than its width at the base, lateral margins thickened.

Only 1 species is known, living in the Chita Region (According to Dovnar-Zapol'skii).

1(1). ♂ vertex wider than the frontal ridge, depressed. ♂ antennae hardly longer than the head and pronotum combined. ♂ tegmina very short, paddle-shaped, nearly reaching the posterior margin of the metanotum. Color of the ♂ brownish-yellow, with a black marking. ♀ un-
219 known. Length of the ♂ 18 mm. —Chita Region, Nerchinsk District: Aktauchi (According to Dovnar-Zapol'skii). *1. C. surda Dov.-Zap.

Dovnar-Zapol'skii, 1933:256, 268.

31. Genus Primnoa F.-W.

Fischer-Waldheim, 1846.248. —Prumna Motschulsky, 1859, Études Ent., VIII:11; Dovnar-Zapol'skii, 1933.256, 262, Miram, 1933-40, 41, Chang, 1940-39, 43. —Podisma subgenus Eupodisma Scudder, 1897, Proc. U.S. Nat. Mus., XX:12, 117. —Podisma subgenus Prumna Jakobson, 1905:204, 314.

Type of genus: Primnoa primnoa F.-W.

Eyes irregularly oval; vertical diameter of the eye slightly greater than its horizontal diameter and almost equal to the subocular groove. Pronotum without lateral carinae; the length of its anterior part 2-2.5 times greater than the length of its posterior part at the median carina; posterior margin distinctly triangularly emarginate. Tegmina lateral, lobe-like, strongly abbreviated. Wings hardly perceptible. Hind femur with a smooth dorsal carina. Hind tibiae dorsally without external apical spine. Prosternal process conical. First abdominal tergite with a well developed tympanic organ. Subgenital plate in the ♂ swollen at the apex, truncate, with distinctly thickened dorsal margin. ♀ ovipositor with pointed valves; tip of valves without teeth.

Eleven species known, living in eastern Asia.

1(4). ♂ cerci in profile strongly compressed in the middle, widened toward the base and toward the apex, apex of cerci rounded (Figures 472, 473).

2(3). Tegmina in both sexes narrow, parallel-sided; length of tegmina in the ♀ nearly 4 times greater than the greatest width. Mesosternum in the ♂ with a wide space between the lobes; its narrowest part 1.5 times greater than its length. ♂ cerci with a narrow apical part; the greatest width of the apical expansion of the cerci 4/5 the width of the cerci at the base (Figure 472). Length of the ♂ 17.0-19.5, ♀ 19.5-26.5 mm; of tegmina ♂ 1.5-2.6, ♀ 2.4-3.1 mm. —Yakutia, Kamchatka (!), Khabarovsk Territory (region of Ayan!) . .*1. P. polaris (Mir.)

Miram, 1928, Materialy Komissii po izucheniyu Yakutskoi ASSR, 24:20, Figures 6-7 (Prumna), Dovnar-Zapol'skii, 1933:260, 267 (Prumna), Miram, 1933:41, 42, Figure 34 (Prumna).

3(2). Tegmina in both sexes wider, distinctly widened toward the apex; length of tegmina in the ♀ nearly 2.5 times greater than the greatest width. Mesosternum in the ♂ with moderately wide space between lobes; its narrowest part hardly greater than its length. ♂ cerci with a wide apical part; the greatest width of the apical expantion of the cerci nearly equals the width of the cerci at the base (Figure 473).

Length of ♂ 17.0-22.5, ♀ 28.5 mm, of tegmina ♂ 3.0-3.5, ♀ 4.2 mm. —Maritime Territory, Sikhote Alin Range: Takkho-ma River. . . . . *2. P. specialis Mistsh.

Mishchenko, 1951, Entomologicheskoe obozrenie, XXXI, 3-4 510, Figures a, e.

220 4 (1). ♂ cerci in profile cone-like, narrowed toward the apex, apex of cercus more or less pointed (Figures 474-481).

5 (18). Supraanal plate of the ♂ short, its greatest length equal to the greatest width (Figures 175, 482-487).

6 (7). Supraanal plate of the ♂ triangular, distinctly narrowed toward the apex (Figure 482). Length of ♂ 20.5-27.4, ♀ 28.5-34.5 mm, tegmina ♂ 2.3-5.2, ♀ 4.2-6 5 mm. —South Khabarovsk Territory, Maritime Territory; Korea . . . . *3. P. primnoides (Ikonn.)

Ikonnikov, 1911, Ezhegodnik Zoologicheskogo muzeya AN, XVI 259, plate V, Figure 1 (Prumna), Dovnar Zapol'skii, 1933.260, 267 (Prumna)

7 (6). Supraanal plate of the ♂ trapezoidal, slightly widened or slightly narrowed toward the apex (Figures 175, 483-487).

8 (9). Tegmina in both sexes with a narrow light band along the upper (posterior) margin. Supraanal plate of the ♂ with broadly rounded posterior margin, posterior margin without triangular median process (Figure 483) Length of ♂ 24, ♀ 30 mm, of ♂ tegmina 4, ♀ 3 5 mm —North China Manchuria, near Siaoling railroad station (According
221 to Ramme) . . . . 4. P. mandshurica (Rme.)

Ramme, 1939, Mitt. Zool. Mus. Berlin, XXIV 137, Figure 55m, tab. II, Figure 5 (Prumna).

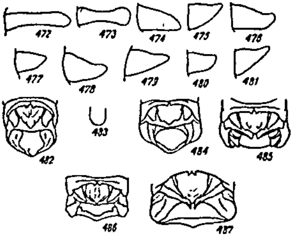
9 (8). Tegmina in both sexes unicolored, without a light band along the upper (posterior) margin. Supraanal plate of the ♂ with a posterior margin which bears a distinct triangular median process (Figures 175, 484-487).

10 (17). Tegmina long, reaching the tympanic organ or extending slightly beyond it.

11 (12). ♂ mesosternum with a wide space between the lobes, its greatest width nearly 1.5 times greater than its length Metasternum in the ♂ wide its greatest width nearly equal to the length of the meso- and metathorax combined (Figure 488). ♀ unknown. Length of ♂ 24 5, of tegmina 4 mm. —Maritime Territory Krivoi Klyuch . . . . *5. P robusta Mistsh

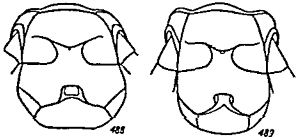
Mishchenko, 1951, Entomologicheskoe obozrenie, XXXI, 3-4:511, Figures b, g

12 (11). Mesosternum in the ♂ with a narrow space between the lobes, its greatest width equal to its length or slightly less than that. Metasternum in the ♂ moderately wide, its greatest width distinctly less than the length of the meso- and metathorax combined (Figure 489).



Figures 472–487
(483 according to Ramme; other original)

472—Primnoa polaris (Mir.), ♂, left cercus from the side; 473—P. specialis Mistsh., ♂, ibid.; 474—P. primnoides (Ikonn.), ♂, ibid.; 475—P. robusta Mistsh., ♂, ibid.; 476—P. assimilis Mistsh., ♂, ibid.; 477—P. tristis Mistsh., ♂, ibid.; 478—P. primnoa F.-W., ♂, ibid.; 479—P. ussuriensis (Tarb.), ♂, ibid.; 480—P. exilis Mistsh., ♂, ibid.; 481—P. litoralis (Tarb.), ♂, ibid.; 482—P. primnoides (Ikonn.), ♂, tip of abdomen from above; 483—P. mandshurica (Rme.), ♂, supraanal plate; 484—P. robusta Mistsh., ♂, tip of abdomen from above; 485—P. tristis Mistsh., ♂, ibid.; 486—P. primnoa F.-W., ♂, ibid.; 487—P. ussuriensis (Tarb.), ♂, ibid.



Figures 488–489. Meso- and metathorax in ♂ from below. (Original)

488—Primnoa robusta Mistsh., 489—P. assimilis Mistsh.

13 (16). Supraanal plate in the ♂ with short straight longitudinal pads in the apical part (Figures 175, 485). Cerci in the ♂ in profile hardly narrowed toward the apex (Figure 476) sometimes distinctly narrowed (Figure 477), then the lobules of the last tergite of the abdomen small, rounded (Figure 485).

14 (15). Lobules of last tergite of the ♂ abdomen long, pointed. Supraanal plate of the ♂ distinctly narrowed toward the apex (Figure 175). ♂ cerci in profile nearly parallel-sided, narrowed only in the apical part (Figure 476). Length of ♂ 27.3, ♀ 33.5-34.5 mm, tegmina ♂ 4.5, ♀ 4.8-5.1 mm. —Maritime Territory Voroshilov†, upper course of the Suputinka . . . . *6. P. assimilis Mistsh.

Mishchenko, 1951, Entomologicheskoe obozrenie, XXXI, 3-4:511, Figures c, h

15 (14). Lobules of last tergite of the ♂ abdomen short, rounded. Supraanal plate in the ♂ nearly parallel-sided, slightly narrowed only in the apical part (Figure 485). ♂ cerci in profile gradually narrowed toward
222 the apex (Figure 477). Length of the ♂ 27.5-32.3, ♀ 33.0-33.5 mm, of tegmen ♂ 4.4-5.2, ♀ 5.1-5.4 mm. —Maritime Territory: Pogranichnaya††, Yakovlevka, Shkotovo (Type from Yakovlevka) . . . . *7. P tristis Mistsh.

Mishchenko, 1951, Entomologicheskoe obozrenie, XXXI, 3-4 513, Figures d, i

16 (13). Supraanal plate in the ♂ with long curved pads, converging at the apex of its posterior median process (Figure 486) ♂ cerci in profile distinctly narrowed toward the apex (Figure 478) Lobules of last abdominal tergite in the ♂ long, pointed (Figure 486). Length of ♂ 20.5-29 5, ♀ 24.4-37.5 mm, of tegmen ♂ 4 8-5.8, ♀ 4.5-5.2 mm. —Eastern Siberia (from Irkutsk Region to Khabarovsk Territory) Maritime Territory (?), Sakhalin, Mongolia (?), Manchuria, Korea, *Sometimes it greatly injures various cereal grasses, truck crops,* and some wild plants (wild grape, nut-trees, etc.) in Khabarovsk Territory . . . . *8. P. primnoa F.-W. —Far Eastern wingless 'young mare' grasshopper [Kobylka beskrylaya dal'nevostochnaya].

Fischer-Waldheim, 1846 248 Jakobson, 1905 204, 314 Figure 37 (Podisma subgen Prumna), Uvarov, 1927b 287, Figure 103 (Prumna) Dovnar Zapol'skii, 1933 260, 266 (Prumna) Miram, 1933 41, Figure 33 (Prumna) Chang, 1940 45 (Prumna) —viridis Motschulsky, 1859, Etudes Ent , VIII 11 (Prumna) —sachaliensis Matsumura, 1911, Journ Coll Agr Toh Imp Univ Sapporo, IV, 1 5, tab I, Figures 6-7 (not Figures 1-2, as shown in the text) (Podisma)

Biology: Engel'gardt, 1925, Zashchita rastenii, II, 6 298, Bei-Bienko, 1932b 31, 227, Rubtsov, 1932: 30, Figures 1C, 3H, 4H, Predtechenskii, Zhdanov and Popova, 1935:87, Zimin, 1938:39, 81.

17 (10) Tegmina in both sexes short, far from reaching the tympanic organ Mesosternum in both sexes with moderately wide space between the lobes, its narrowest part in the ♂ is equal to, in the ♀ 1.5 times
223 greater than its length Lobules of the last abdominal tergite in the ♂ large, pointed Supraanal plate in the ♂ with distinct curved pads at

† [Now Ussuriisk]

†† [An error, since the Pogranichnaya (Suifenho) Station is located in Chinese territory near the U S S R border.]

the posterior margin and with a distinct triangular tooth in the middle of the posterior margin (Figure 487). Length of ♂ 24.0-29.2, ♀ 29.5-33.4 mm; of tegmina ♂ 2.1-2.6, ♀ 2.5-3.0 mm. —Maritime Territory. (Figure 492) ......*9. P. ussuriensis (Tarb.)

Tarbinsky, 1930, Konowia, IX:189, Figures 8-9 (Prumna), Dovnar-Zapol'skii, 1933:260, 267 (Prumna).

18 (5). Supraanal plate in the ♂ elongated; its length considerably greater than its greatest width (Figures 490, 491).

19 (20). Tegmina in both sexes short, hardly reaching the middle of the metanotum. Supraanal plate in the ♂ with a distinct triangular tooth in the middle of the lateral margins; posterior median process distinct, pointed; posterior angles pointed (Figure 490). Length of ♂ 24.5, ♀ 32.5 mm; of tegmina ♂ 1.7, ♀ 2 mm. —Maritime Territory; Chandalaza, Suchan ....*10. P. exilis Mistsh.

Mishchenko, 1951, Entomologicheskoe obozrenie, XXXI, 3-4·514, Figures e, j.

20 (19). Tegmina in both sexes longer, reaching the middle of the first abdominal tergite or its posterior margin. Supraanal plate of the ♂ without triangular tooth in the middle of the lateral margins; posterior median process widely rounded; posterior angles hardly perceived, rounded (Figure 491). Length of ♂ 26, of ♀ 23.5 mm; of tegmina ♂ 4, ♀ 4.1 mm. —Maritime Territory, Slavyanskii Bay: Bol'shoi Tulamu..................*11. P. litoralis (Tarb.)

Tarbinskii, 1932, Izvestiya Leningradskogo instituta po bor'be s vreditelyami Sel'skogo i lesnogo khozyaistva, 2:204 (Prumna).

32. Genus Parapodisma Mistsh.

Mistshenko, 1947, Proc. R. Ent. Soc. Lond., (B), XVI, 1-2:10.—Podisma Jakobson, 1905:173, 309 (partim), Shiraki, 1910:52, 69 (partim).-Miramella Dovnar-Zapol'skii, 1933:255, 258, 262, 266 (partim). —Odontopodisma Ramme, 1939, Mitt. Zool. Mus. Berlin, XXIV:140, 141, 147 (partim).

Type of genus: Parapodisma mikado (I. Bol.).

Head irregularly oval; vertical diameter of eye slightly larger than its horizontal diameter and nearly equal to the subocular groove. Pronotum without lateral carinae, the length of the anterior part 1.5-1.75 times greater than the length of its posterior part at the median carina; posterior margin rounded or incised. Tegmina greatly abbreviated, hardly reaching beyond the posterior margin of the first abdominal tergite. Wings hardly perceptible. Hind femur with a sharp spine on the apex of the dorsal smooth carina. Hind tibiae dorsally without the external spine at the distal end. Prosternal process conical. First abdominal tergite with well developed tympanic organ. Last abdominal tergite in the ♂ medially split, its posterior margin without lobules. ♀ ovipositor with pointed valves; tip of valves without teeth.

About 5 species are known, distributed in the Kurile Islands and in Japan. Most of the species were very poorly studied and still worse described, and therefore many of them are conditionally included in this genus.

1 (8). ♀ pronotum either with rounded or with almost truncate slightly incised posterior margin. ♂ cerci constricted in the middle part, widened toward base and apex; apex rounded or blunt (Figures 493, 495).
224

2 (5). Tegmina wide in both sexes, length of tegmen less, equal to or 1.25-1.5 times greater than their greatest width. ♂ cerci slightly bent inward (Figure 494).

3 (4). Hind femur in the ♀ with a red ventral aspect. ♂ cerci depressed in the apical part. Subgenital plate of the ♂ on the apex produced in the form of a conical process, its dorsal margin entire, semicircular. Length of ♂ 20.0-21.5, ♀ 30.5-33.0 mm, tegmina ♂ 1, ♀ 4.5-6.0 mm. —Kurile Islands (Kunashiri Island); Japan. (♂ according to Rehn and Shiraki). *1. P. mikado (I. Bol.)

I. Bolivar, 1890, An. Soc. Esp. Hist. Nat., XIX 323 (Pezotettix), James Rehn, 1902, Proc. Acad. Nat. Sci. Phil. :637 (Podisma), Jakobson, 1905:315 (Podisma), Shiraki, 1910:70, 71 (Podisma).

4 (3). ♂ cerci smooth in the apical part (Figure 493). Subgenital plate in the ♂ apically produced in the form of an open groove (Figure 494). ♀ unknown. Length of ♂ 18.0-18.7, tegmina 5-7 mm. —Japan (Honshu Island) (According to Hebard) . . . 2 P. subaptera (Heb.)

Hebard, 1924, Trans. Amer. Ent. Soc., L, 3:221, Figures 1-2 (Podisma) —fauriei Shiraki, 1910 70, 73 (Podisma) (nec I. Bolivar).

5 (2). Tegmina narrow in both sexes, length of tegmina 2-3 times greater than their greatest width. ♂ cerci sharply curved inward almost at a right angle (Figure 495).

6 (7). Pronotum in the ♀ with a yellow spot in the middle of the lateral lobes. Pronotum in the ♀ with a weakly emarginate posterior margin. ♂ unknown. Length of ♀ 31, tegmina 4.5 mm —Japan (According to I. Bolivar). . . . . 3. P. fauriei (I. Bol.)

I. Bolivar, 1890, An. Soc. Esp. Hist. Nat., XIX 322 (Pezotettix), Jakobson, 1905:315 (Podisma).

7 (6). Pronotum in both sexes with unicolored lateral lobes, yellow-green or brownish-green, some with a black band in the dorsal part ♂
225 cerci sharply bent inward almost at a right angle (Figure 495). ♀ ovipositor with long valves. Length of ♂ 24, ♀ 31.5 mm, tegmina ♂ 3, ♀ 4 mm. —Japan (According to Scudder) . . . . 4 P. dairisama (Scudd.) †

Scudder, 1897, Proc. U.S. Nat. Mus , XX 112, 114, tab. VIII, Figure 7 (Podisma) Jakobson, 1905 203, 311 (Podisma).

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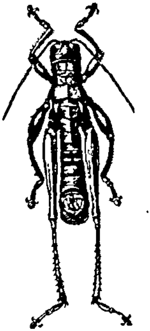
† Hebard (1924, Trans. Amer. Ent. Soc., L, 3 219, 221) assumes that P dairisama (Scudd.) is a synonym of P. fauriei (I Bol) Unfortunately, the absence of material makes it impossible to resolve this question at present.



Figures 490-491. Tip of abdomen in ♂ from above. (Original)

490—Primnoa exilis Mistsh.; 491—P. litoralis (Tarb.).

Figure 492. Primnoa ussuriensis (Tarb.), ♂. (Original)

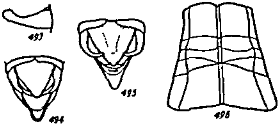


Figure 493-496. (Figures 493-494 according to Hebard, Figure 495 according to Scudder with alterations, Figure 496 according to Shiraki with alterations).

493—Parapodisma subaptera (Heb.), ♂, right cercus from side; 494—P. subaptera (Heb.), ♂, tip of abdomen from above; 495—P. dairisama Scudd., ♂, ibid.; 496—P. sapporensis (Shir.), ♀, pronotum from above.

8 (1). Pronotum of ♀ with distinctly emarginated posterior margin (Figure 496). ♂ cerci pointed. Tegmina reaching the second abdominal tergite. Hind femur yellow or reddish-brown, with a black distal end. Hind tibiae blue, sometimes light-yellow at base and apex. Length of ♂ 17.0-18.5, ♀ 23.5-25.2mm; tegmina ♂ 2.0-2.8, ♀ 2.4-4.0mm. —Japan (Hokkaido Island). (According to Shiraki) ....5. P. sapporensis (Shir.)

Hebard, 1924, Trans. Amer. Ent. Soc., L, 3:221 (Podisma).—sapporense Shiraki, 1910:70, 76, tab. II, Figures 5a–c (Podisma).

33. Genus Miramella Dov.-Zap.

Dovnar-Zapol'skii, 1933:255, 258, 262, 266 (partim), Chang, 1940:40, 50.—Pezotettix Brunner-Wattenwyl, 1882:86, 222 (partim).—Podisma Jakobson, 1905:173, 203, 309 (partim), Chopard, 1922:170 (partly), Obenberger, 1926:64, 95 (partim)—Melanoplus Dovnar-Zapol'skii, 1933:254, 257, 262, 264 (partim).

Type of genus: Miramella solitaria (Ikonn.)

Eyes irregularly oval, vertical diameter of eye slightly greater than its horizontal diameter and nearly equal to the subocular groove. Pronotum without lateral carinae, the length of its anterior part 1.5-2 times greater than the length of its posterior part at the median carina, posterior margin rounded, slightly emarginate in the middle. Tegmina either strongly abbreviated, or developed and reaching the middle of the hind femurs. Wings usually hardly visible, sometimes well developed Hind femur without a spine on the apex of the dorsal smooth carina. Hind tibiae dorsally without an external apical spine. Prosternal process conical, first abdominal tergite with a well-developed tympanic organ. Last abdominal tergite in the ♂ with distinct lobules. Subgenital plate in the ♂ with apex drawn out in the form of a conical cusp. ♀ ovipositor with 2 teeth on the tip of the valves.

Three species known, distributed in western Ukraine, western Europe, Maritime Territory and in Manchuria.

I am provisionally including Miramella sinense Chang in this genus, this species is not known to me in Nature, but judging from the description and drawings, it apparently belongs to the genus Anapodisma Dov.-Zap., being quite possibly a synonym of A miramae Dov.-Zap.

1 (2). ♂ vertex medially with a distinctly longitudinal groove ♂ tegmina shorter, only reaching the tympanic organ, not covering it Lobules of last abdominal tergite of the ♂ rather long, narrow, with pointed apex, reaching 1/5 of the length of the supraanal plate. ♂ cerci conical, sharply narrowed from base to apex, dorsal and ventral margins of
226 cerci strongly concave. ♀ unknown. Length of ♂ 17.5, tegmina 2mm. —North China Manchuria. (According to Chang) ....1 M. sinense Chang.

Chang, 1940:54, tab. I, Figures 6, 8 tab. II, Figures 3, 9, 14.

2 (1). Vertex in both sexes without a longitudinal groove in the middle. Tegmina in both sexes longer, extending beyond the tympanic organ, entirely covering the latter. Lobules of last abdominal tergite in the ♂ short and wide, with rounded apex, reaching 1/6 of the length of the supraanal plate. ♂ cerci conical, gradually narrowed from base to apex; sometimes dorsal and ventral margins of cerci weakly concave.

3 (4). Antennae in both sexes short and stout, length of the single middle segment hardly or 1.25-1.5 times greater than the greatest width. Tegmina in both sexes unicolored—brownish. Hind femora in both sexes with a yellow or yellowish ventral aspect; ventral part of outer aspect red; inner side black with 2 complete light bands. Hind tibiae in both sexes yellow, sometimes blackish only at the base. Prosternal process in both sexes stout, short, usually with blunted apex. Mesosternum in the ♀ with a wide space between the lobes, its narrowest part 1.5 times greater than its length . . . . *2. M. alpina (Koll.)

a(b). Tegmina lateral, short, reaching the second abdominal tergite. Wings hardly perceptible. Length of ♂ 14.0-17.5, ♀ 21-27 mm; tegmina ♂ 2.5-4.0, ♀ 4.0-4.5 mm. —Western Ukraine; eastern Switzerland, southern Germany, Austria, Yugoslavia, Hungary, Romania, Poland, Czechoslovakia. Injures various truck crops in southern Austria, and woody varieties in Poland . . . . *2a. M. alpina alpina (Koll.)

—alpinus Kollar, 1833, Beitr. Landesk. Oesterr., III:83 (Gryllus); Brunner-Wattenwyl, 1882:223, 224, Figure 53 (Pezotettix, partim); Dovnar-Zapol'skii, 1933:254, 264 (Melanoplus). —pulchellum Herrich-Schaffer, 1840, Nomenclator entomologicus, II, Orth.:8 (Acridium). —frigidum Fischer, 1849, Jahresb. Mannh. Ver. Naturk., XV:38 (Podisma) (nec Boheman). —alpinus var. alpina Brunner-Wattenwyl, 1882:224 (Pezotettix). —alpina Jakobson, 1905:204, 313 (Podisma, partly); Chopard, 1922:137, 170, Figures 428, 430, 431 (Podisma, partim). —alpina var. alpina subvar. carinthiaca Puschnig, 1910, Verh. zool.-bot. Gesel. Wien, LX:27, 28 (Podisma). —alpinum Obenberger, 1926:98, Figure 21, tab. III, Figures 137, 142, 157 (Podisma). —alpinum var. carinthiacum Obenberger, 1926:98 (Podisma). —alpina f. leisleri Ramme, 1931, Mitt. Zool. Mus. Berlin, XVII·197 (Podisma).

Biology: Bei-Bienko, 1932b:30, 227.

227 b(a). Tegmina and wings rather well developed, extending beyond the middle of the abdomen. Length of ♂ 16-23, ♀ 24-31 mm; tegmina ♂ 7-12, ♀ 9-15 mm. —Western Ukraine; Czechoslovakia, Austria, Yugoslavia, Hungary, Romania. Sometimes injures beech, alder, and other trees . . . . *2b. M. alpina collina (Br.-W.)

Jakobson, 1905:314 (Podisma). —alpinus var. collina Brunner-Wattenwyl in: Künstler, 1864, Verh. zool.-bot. Gesel. Wien, XIV 773, 775 (Pezotettix); Brunner-Wattenwyl, 1882:224 (Pezotettix). —alpinum var. collinum Obenberger, 1926:99 (Podisma). —alpinus collinus Dovnar-Zapol'skii, 1933:254, 264 (Melanoplus).

4 (3). Antennae in both sexes long and slender; length of the single middle segment 3-3.5 times greater than its greatest width. Tegmina in both sexes with a yellow dorsal (posterior) margin. Hind femora in both sexes with a blackish-red ventral aspect; ventral part of outer aspect black; inner aspect black with 2 light bands of which the median band is incomplete [sic!]. Hind tibiae in both sexes all black.

Prosternal process in both sexes, slender, long, sharply pointed. Mesosternum of the ♀ with a moderately wide space between the lobes; its narrowest part is hardly greater than its length. Length of ♂ 20.5-21.6, ♀ 26.5-28.0 mm; tegmina ♂ 5.4-5.8, ♀ 5.5-5.9 mm. — South Maritime Territory (Figure 497) .... *3. M. solitaria (Ikonn.)

Ikonnikov, 1911, Ezhegodnik Zoologicheskogo muzeya AN, XVI 263, plate V, Figure 4 (Podisma), Dovnar-Zapol'skii, 1932:255, 266.

34. Genus Pseudopodisma Mistsh.

Mistshenko, 1947, Proc. R. Ent. Soc. Lond., (B), XVI, 1-2:11. —Pezotettix Brunner-Wattenwyl, 1882:86, 222 (partim). —Podisma Jakobson, 1905:173, 203, 309 (partim), Obenberger, 1926:64, 95 (partim). —Odontopodisma Dovnar-Zapol'skii, 1933:255, 258, 262, 265 (partim).

Eyes irregularly oval, vertical diameter of the eye nearly 1.5 times greater than its horizontal diameter and nearly equal to the subocular groove. Pronotum without lateral carinae, length of its anterior part 1.75-2 times greater than the length of its posterior part at the median carina; posterior margin rounded, sometimes slightly emarginate in the middle. Tegmina lateral, strongly abbreviated, reaching the second abdominal tergite. Wings hardly perceptible. Hind femur without a spine on the apex of the dorsal smooth carina. Hind tibia without the external apical spine on the dorsal aspect. Prosternal process conical. First abdominal tergite with well-developed tympanic organ. Last abdominal tergite without lobes on the posterior margin in the ♂. Subgenital plate of the ♂ with a blunt weakly rounded apex. ♀ ovipositor with pointed valves, these without teeth on the tip.

Only 1 species is known, living in the mountains of western Ukraine and southeastern Europe.

1 (1). Mesosternum in both sexes with a narrow space between the lobes, its narrowest part in the ♂ hardly less than in the ♀ nearly equal to
228 its length. Supraanal plate in the ♂ triangular, with 2 triangular processes in the middle of the lateral margins, with 2 longitudinal pads in the middle of the posterior margin, and with a longitudinal depression at the base (Figure 186). Length of ♂ 17-23, ♀ 23.0-30.4 mm, tegmina in the ♂ 3-4, ♀ 4-6 mm. —Western Ukraine, Czechoslovakia, Hungary, Yugoslavia, Bulgaria, Romania .... *1. P. fieberi (Scudd.)

Scudder, 1897, Proc. U S. Nat. Mus., XX:112, 115, tab. VIII, Figure 8 (Podisma) Jakobson, 1905: 204-312 (Podisma), Obenberger, 1926:97, tab. III, Figures 140-141 (Podisma) Dovnar-Zapol'skii, 1933 255, 260, 265, Figure 4 (Odontopodisma). —schmidtii Brunner-Wattenwyl, 1861, Verh. zool-bot. Gesel. Wien, XI:306, tab. XVI, Figures 23A, 23B (Pezotettix) (nec Fieber) —schmidti Brunner-Wattenwyl, 1882 223, 225 (Pezotettix) (nec Fieber).

35. Genus Podisma Berth.

Berthold, 1827, Latreille's Natürliche Familien des Thierreichs:411; Jakobson, 1905:173, 203, 309 (partim); Shiraki, 1910:52, 69 (partim); Obenberger, 1926:64, 95 (partim); Uvarov, 1927a:169, 190 (partim); Dovnar-Zapol'skii, 1933:254, 256, 261, 263; Miram, 1933:39, 40, Berezhkov, 1937:33, 49 (partim); Tarbinskii, 1940:21, 149; Chang, 1940:38, 45; Tarbinskii, 1948:109, 110, Mishchenko, 1950a:175, 183.—Pezotettix Brunner-Wattenwyl, 1882:86, 222 (partim).—Miramella Dovnar-Zapol'skii, 1933:255, 258, 262, 266 (partim).

Type of genus: Podisma pedestris (L.).

Eyes nearly round; vertical diameter of the eye nearly equal to its horizontal diameter and in the ♂ nearly equal to the subocular groove, but in the ♀ slightly smaller than it is. Pronotum without lateral carinae; the length of its anterior part 1.25 times greater than the length of its posterior part at the median carina; posterior margin rounded, sometimes hardly emarginate in the middle. There are no tegmina, or they are greatly abbreviated, lateral, hardly reaching the first abdominal tergite. No wings, or they are hardly perceptible. The wings and tegmina are rarely well developed. Hind femur without a spine on the apex of the dorsal smooth carina. Hind tibiae dorsally without an apical external spine. Prosternal process conical. First abdominal tergite with well-developed tympanic organ. Last abdominal tergite in the ♂ with 2 distinct lobules on the posterior margin. Subgenital plate in the ♂ bluntly conical. ♀ ovipositor with pointed valves; these without teeth on the tip.

Ten species known, distributed in Europe, the Caucasus, and northern Asia.

1 (6). Tegmina longer, reaching the posterior margin of the first and second tergites of the abdomen, completely covering the tympanic
229 orga or extending beyond it. The tegmina and wings are rarely well ueveloped—f. macroptera.

2 (3). Hind femora in both sexes with a red ventral aspect. ♀ ovipositor with a sharp tooth on the outer ventral margin of the ventral valves (Figure 499) . . . . *1. P. pedestris (L.)—Wingless 'young mare' grasshopper [Kobylka beskrylaya].

a (b). Tegmina in the ♂ usually reaching the second abdominal tergite, separated at the base by a wide space; length of tegmina in the ♀ 1.25-1.5 times greater than the greatest width; in f. macroptera the tegmina are well developed, extending beyond the distal end of the hind femora in both sexes. Length of ♂ 15-22, ♀ 18.5-30.5 mm; tegmina in the ♂ 2.0-3.5, in the ♀ 1.8-5.0 mm; in f. macroptera the length of the ♂ is 19.5-22.3, ♀ 19.8-23.4 mm. —Almost all the European part of the U.S.S.R. (to the lower Donets), North Caucasus, western and northern Kazakhstan, southern Siberia (north to the Vilyuisk District in Yakutia); western Europe, northern Mongolia. Sometimes a pest chiefly in the forest steppe region, to different cereal grass, truck and melon crops, hay fields, orchards, and woody varieties (Figure 498) . . *1a. P. pedestris pedestris (L.)

Dovnar-Zapol'skii, 1933:254, 259, 263, Figure 3, Mishchenko, 1950a:184, 187.—pedestris Linnaeus, 1758, Syst. Nat. (ed. X), I:433 (Gryllus Locusta), Jakobson, 1905:204, 312, plate VII; Uvarov, 1927a: 190, Figure 212, Uvarov, 1927b:285, Figure 102, Miram, 1933:40, Berezhkov, 1937:50, 71, 80, Figure 50, Chang, 1940:47; Tarbinskii, 9948:110, Figure 141, Mishchenko, 1950a:186.—apterum DeGeer, 1773,

Mém. Ins., III:474, tab. XXIII, Figures 8-9 (Acrydium). —pedestris var. alata and var. major Puschnig, 1910, Verh. zool.-bot. Gesel. Wien, LX:27. —pedestre Obenberger, 1926.98, tab. III, Figures 129, 136, 144. —pedestre var. alatum and var. maius Obenberger, 1926 98.

Biology: Bei-Bienko, 1928a:195, Bei-Bienko, 1932b:30, 227, Rubtsov, 1932c:29, Figures 2B, 4F, 41; Predtechenskii, Zhdanov and Popova, 1935:86, Zimin, 1938:39, 80, plate V, Figure 27, plate X, Figure 57, Tarbinskii, 1940:225.

b(a). ♂ tegmina reaching the third abdominal tergite, at the base separated by a very narrow space; length of ♀ tegmina nearly double the greatest width. Length of ♂ 22-24, ♀ 28-38 mm, tegmina ♂ 4.5, ♀ 6.5 mm. —Krasnodar Territory: Pseashkho, northwestern Georgia Teberda and Klukhor. . . *1b. P. pedestris sviridenkoi Dov.-Zap.

Dovnar-Zapol'skii, 1927, Izvestiya severo-Kavkazskoi kraevoi stantsii zashchity rastenii, 3 184, 195, Dovnar-Zapol'skii, 1933:254, 259, 263, Tarbinskii, 1940:21, Tarbinskii, 1948:110, Mishchenko, 1950a 185, 188.

3 (2). Hind femora in both sexes with a yellow ventral aspect. ♀ ovipositor with several indistinct denticles on the outer ventral margin of the ventral valves (Figure 500).

4 (5). Vertex in the ♀ flat. Eyes in the ♀ large, vertical diameter of the eyes nearly equal to the subocular groove. Pronotum of the ♀ with a long posterior part, greatest length of its posterior part 4/5 the greatest length of its anterior part. ♀ tegmina broad, greatest width of tegmina 4/9 the length. ♂ unknown. Length of ♀ 27.0-31.5 mm; tegmina 3.5-5.0 mm. —Southern Maritime Territory, Kamen-Rybolov, North China Manchuria (!). .*2. P. aberrans Ikonn.

Ikonnikov, 1911, Ezhegodnik Zoologicheskogo muzeya AN, XVI 262 Dovnar-Zapol'skii, 1933:255, 266 (Miramella?).

230 5 (4). Vertex depressed in both sexes. ♀ eyes small, vertical diameter of the eye 2/3 the subocular groove, Pronotum in both sexes with a short posterior part, greatest length of its posterior part 2/3 the greatest length of its anterior part. Tegmina in both sexes narrow, greatest width of tegmina 1/3-4/13 the length. Length of ♂ 17.6-19.2, ♀ 26.2 mm, tegmina ♂ 2.3-2.8, ♀ 3.4 mm. —Kurile Islands Kunashiri Island. . . . . *3. P. kurilensis B.-Bienko.

Bei-Bienko, 1949, Entomologicheskoe obozrenie, XXX 316, Figure 7.

6 (1). Tegmina very small, barely reaching the first abdominal tergite, sometimes there are no tegmina at all. Tympanic organ of first abdominal tergite open [i.e., not covered].

7 (10). Hind femur with a red or reddish-violet ventral aspect.

8 (9). Pronotum with rounded anterior margin, which is without a triangular notch at the middle carina (Figure 501). Hind tibiae violet. ♀ ovipositor with a sharp tooth on the outer ventral margin of the ventral valves (Figure 502). Length of ♂ 16.5-21.5, ♀ 23.5-29.5 mm, tegmina ♂ 1.2-2.0, ♀ 1.1-3.2 mm. —South Krasnodar Territory. . . . . *4. P. uvarovi Rme.

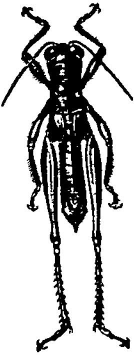


Figure 497. Miramella [solitaria] (Ikonn.), ♂. (Original)

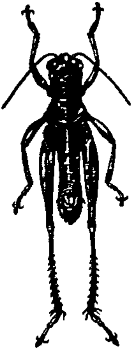
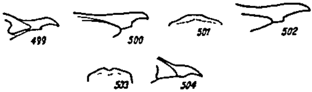


Figure 498. Podisma pedestris pedestris (L.), ♂. (Original)



Figures 499–504
(Original)

499—Podisma pedestris pedestris (L.), ♀, left ventral valve of ovipositor from the side, 500—P. aberrans Ikonn., ♀, ibid.; 501—P. uvarovi Rme., ♂, anterior margin of pronotum from above; 502—P. uvarovi Rme., ♀, left ventral valve of ovipositor from the side; 503—P. miramae Sav., ♂, anterior margin of pronotum from above, 504—P. miramae Sav., ♀, left ventral valve of ovipositor from the side.

Ramme, 1926, Deutsch. Ent. Zeit.:278, Figures 1a, 2a, tab. II. Figures 8a-b, Dovnar-Zapol'skii, 1933 254, 259, 264, Tarbinskii, 1940.21, Tarbinskii, 1948:110, Mishchenko, 1950a:185, 188, Figures 1-2.

9 (8). Pronotum with a distinct triangular incision at the median carina on the anterior margin (Figure 503). Hind tibiae gray-blue or blackish-blue. ♀ ovipositor without a tooth on the external ventral margin of the ventral valves (Figure 504). Length of ♂ 18.7, ♀ 26 mm, tegmina ♀ 0.2 mm; there are no tegmina in the ♂. —Georgia, Svanetia· Lagilda Range . . . . *5. P. miramae Sav.

Savenko, 1941, Trudy Zoologicheskogo sektora Gruzinskogo filiala AN SSSR, III 27, Figure 2, Mishchenko, 1950a:185, 189, Figures 3-4

231 10 (7). Hind femora with a yellow or yellow-greenish ventral aspect. . . . . *6. P. satunini Uv.

a (b). Frontal ridge in the ♀ hardly depressed near the middle ocellus. Mesosternum in both sexes with a wide space between the lobes, its narrowest part in the ♂ 1.25, in the ♀ 1.75 times greater than its length. Length of ♂ 18-20, ♀ 25-28 mm; tegmina ♂ 1.0-1.8, ♀ 0.9-1.0 mm. —Abkhazia. . . . . *6a. P. satunini satunini Uv.

Mishchenko, 1950a 185, 192 —satunini Uvarov, 1916, Izvestiya Kavkazskogo muzeya, X 46, Dovnar-Zapol'skii, 1933 254, 259, 264, Tarbinskii, 1940.21, Mishchenko, 1950a:185, 190.

b (a). Mesosternum in both sexes with a moderately wide space between the lobes, its narrowest part in the ♂ is equal to its length, in the ♀ it is 1.25 times greater than the length or even 1.75 times greater than the latter, while the frontal ridge is nearly completely distinctly emphasized.

c (d). Mesosternum in the ♀ with a wide space between the lobes, its narrowest part 1.75 times greater than its length. The subgenital plate in the ♂ conical, its apex slightly rounded (Figure 505). Length of body of the ♂ 18.7, ♀ 21.3-27.8 mm, tegmina ♂ 0.2, ♀ 1.0-1.1 mm. — Abkhazia· Teimas Range; Krasnodar Territory Zagdanskaya valley. *6b. P. satunini pallipes Mistsh

Mishchenko, 1950a 185, 192, Figure 5.

d (c). Mesosternum in the ♀ with a fairly wide space between the lobes, its narrowest part 1.25 times greater than its length. Subgenital plate in the ♂ bluntly conical; its apex weakly truncate, sometimes emarginate (Figures 506, 507).

e (f). ♀ antennae stout, length of the single middle segment of the antenna hardly or 1.25 times greater than its greatest width. Pronotum in both sexes with large distinct punctures in the posterior part. Mesosternal lobes in the ♂ fairly wide, the narrowest part of the lobes equal to the length (Figure 508). Length of ♂ 21.8, ♀ 27.0-27.4 mm, tegmina ♂ 0.7, ♀ 0.8-1.2 mm. —Krasnodar Territory Krasnaya Polyana, Mt. Aibga . . . . . . *6c. P. satunini coeruleipes Mistsh.

—coerulipes Mishchenko, 1950a:185, 193, Figure 6.

f (e). ♀ antennae more slender; length of a single median segment of the antenna 1.5-1.75 times greater than its greatest width. Pronotum in both sexes with effaced indistinct punctures in the posterior part. Mesosternal lobes wide in the ♂; narrowest part of the lobes 1.5-
232 1.75 times greater than the length (Figure 509). Length of ♂ 17.6-20.9, ♀ 25.4-26.5; tegmina ♂ 0.2-0.9, ♀ 0.8-1.1mm. —South Krasnodar Territory: Arkhyz River. . .*6d. P. satunini fuscipes Mistsh.

Mishchenko, 1950a:186, 193, Figure 7.

36. Genus Melanoplus Stål.

Stål, 1873, Recens. Orth., I:79; Dovnar-Zapol'skii, 1933:254, 257, 262 (partly); Miram, 1933:39, 40, Chang, 1940:39, 40, Tarbinskii, 1948:110, 111.—Monopterus Fischer-Waldheim, 1846:252 (partim).—Pezotettix Stål, 1873, Recens. Orth., I:39, 74, 77 (partim).—Podisma Jakobson, 1905:173, 203, 309 (partim); Uvarov, 1925c:86, 88 (partim); Obenberger, 1926:64, 95 (partly); Uvarov, 1927a:169, 190 (partim); Berezhkov, 1937:33, 49 (partim).

Type of genus: Melanoplus femur-rubrum (De Geer), North America.

Eyes short oval; vertical diameter of the eye hardly greater than its horizontal diameter and in the ♂ hardly greater than the subocular groove but in the ♀ nearly equal to it. Pronotum without lateral carinae or they are very indistinct; the length of its anterior part is 1.25-1.5 times greater than its posterior part; posterior margin rounded or angularly projecting. Tegmina and wings either abbreviated or well developed. Hind femur without a spine on the apex of the dorsal smooth carina. Hind tibia dorsally without external apical spine. Prosternum with a median conical process. First abdominal tergite with a large, open [or uncovered] tympanic organ. Last abdominal tergite in the ♂ usually with 2 distinct lobes on the posterior margin. ♂ cerci in profile or variegated form, in Soviet M. frigidus (Boh.) it is wide, slightly widened at the apex. Subgenital plate in the ♂ more or less conical. ♀ ovipositor with short pointed valves; valves without teeth on the tip.

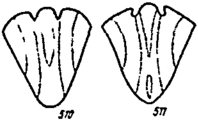
About 200 species are known which are distributed in North and Central America; one species lives in northern Europe and northern Asia.

In 1940, Uvarov (Ann. Mag. Nat. Hist. (11) VI:113), on the basis of Jakobson's (1905:315) assumption, stated that Monopterus gracilis F. W. is none other than Podismopsis altaica Zub. However, the presence of the type (♀) of M. gracilis F.-W. in the collections of the Zoological Institute of the Acad. Sci., U.S.S.R., is evidence of the fact that in describing this species, Fischer-Waldheim (1846:252) evidently dealt with 2 species: the first species is ♂ Podismopsis altaica Zub., and the second one (the type ♀ studied by us) is M. frigidus (Boh.).

1 (1). Tegmina usually fusiform, nearly reaching the middle of the hind femur, in f. macroptera extending beyond its distal end. Hind tibia red. Lobule of last abdominal tergite in the ♂ usually with a pointed apex (Figure 510), more rarely with a rounded apex (Figure 511). ♂ supraanal plate triangular, with 2 indistinct longitudinal pads in the middle of the posterior margin and with a longitudinal depression in the basal half. . . . . *1. M. frigidus (Boh.)—Polar 'young mare' grasshopper [Kobylka polyarnaya].

Figures 505-509
(Original)

505—*Podisma satunini pallipes* Mistsh., ♂, apex of subgenital plate from above 506—*P. satunini coeruleipes* Mistsh., ♂, ibid.; 507—*P. satunini fuscipes* Mistsh., ♂, ibid.; 508—*P. satunini coeruleipes* Mistsh., ♂, mesothorax from below, 509—*P. satunini fuscipes* Mistsh., ♂, ibid.



Figures 510, 511. *Melanoplus frigidus frigidus* (Boh.), supraanal plate in ♂. (Original)

Figure 512. *Melanoplus frigidus frigidus* (Boh.), ♂. (Original)

a(b). Eyes in the ♂ larger; vertical diameter of the eye considerably greater than the subocular groove. Mesosternum in both sexes with a moderately wide space between the lobes; its narrowest place in the ♂ is distinctly less than its length, but in the ♀ it equals or is 1.25 times greater than that length. Length of ♂ 15.3-21.7, ♀ 19.5-
233 32.3 mm; tegmina ♂ 6.3-7.5, ♀ 6.0-11.2, in f. macroptera ♂ 14.5-17.8, ♀ 22.0-25.6 mm. – Northern part of European part of the U.S.S.R., north Kazakhstan (Borovoe), Siberia (south – in the mts.), Sakhalin; western Europe, northern Mongolia, Alaska (Figure 512) . . . . *1a. M. frigidus frigidus (Boh.)

–frigidus Boheman, 1846, Ofvers. Vet. Akad. Forh.:80 (Gryllus); Dovnar-Zapol'skii, 1933:254, 267; Miram, 1933:41; Chang, 1940:42, Tarbinskii, 1948:111. –gracilis Fischer-Waldheim, 1846:252 (Monopterus, partim); Jakobson, 1905:315 (Podisma, partim). –frigida Jakobson, 1905:204, 314 (Podisma), Uvarov, 1927a:190, 191 (Podisma), Berezhkov, 1937:50, 72 (Podisma). –prossenii Puschnig, 1910, Verh. zool.-bot. Gesel. Wien, LX:28, Figure 11 (Podisma). –baicalensis Uvarov, 1914, Ezhegodnik Zoologicheskogo muzeya AN, XIX:171 (Podisma). –frigidum Obenberger, 1926:99, tab. III, Figures 138, 139 (Podisma).

Biology: Bei-Bienko, 1928a:196; Rubtsov, 1932c:29, 30.

b(a). Eyes in both sexes small; vertical diameter of the eye equal to the subocular groove, sometimes in the ♂ it is hardly larger than this groove. Mesosternum in both sexes with a wider space between the lobes; its narrowest part in the ♂ equal to or slightly greater than its length, but in the ♀ it is nearly twice that length. Length of ♂ 16.5-17.5, ♀ 22.5-29.1 mm; tegmina ♂ 5.2-7.0, ♀ 7.5-8.0 mm. – Kamchatka . . . . *1b. M. frigidus kamtshatkae (Sjöst).

–frigida var. kamtchatkae Sjöstedt, 1936, Ark. f. Zool., XXVIII, A, 7:16 (Podisma).

37. Genus Ognevia Ikonn.

Ikonnikov, 1911, Ezhegodnik Zoologicheskogo muzeya AN, XVI:267; Dovnar-Zapol'skii, 1933:256, 257, 262.

Eyes nearly round; vertical diameter of the eye nearly equal to its horizontal diameter and in the ♂ equal to the subocular groove, but in the ♀
234 smaller than that groove. Pronotum without lateral carinae; the length of its anterior part in the ♀ is nearly 1.5 times greater than the length of its posterior part at the median carina; posterior margin broadly rounded. Tegmina and wings well developed. Hind femur with a smooth dorsal carina; ventral margin of ventral genicular lobe straight on the outer side; ventral apical angle of ventral lobe slightly produced; dorsal carina apically without a spine. Hind tibia dorsally without an outer apical spine and with 9-11 spines on the outer margin. Prosternal process conical. First abdominal tergite with a large, open [or uncovered] tympanic organ. Last abdominal tergite in the ♂ with 2 distinct lobules on the posterior margin. Cerci in both sexes conical, in the ♂ gradually narrowed toward the apex; length of cercus in the ♂ 2.0-2.25, and in the ♀ twice the greatest width. Subgenital plate in the ♂ conical, with slightly produced apex. ♀ ovipositor with short pointed valves; these without teeth on the tip.

Only one species, in the Maritime Territory and in Korea, is known, it is divided into 2 subspecies.

1 (1). Mesosternum in both sexes with a moderately wide space between the lobes, its narrowest part in both sexes nearly equal to its length. Supraanal plate in the ♂ triangular, with weakly rounded apex . . . . *1. O. sergii Ikonn.

a(b). Lobules of last abdominal tergite in the ♂ broadly rounded on the apex (Figure 513). ♀ ovipositor with weakly emarginate ventral margin of the ventral valves which are without a tooth before the base (Figure 514). Length of ♂ 18.0-24.7, ♀ 28.5-36.0 mm, tegmina ♂ 16.5-17.6, ♀ 19.6-24.8 mm. —Maritime Territory. . . . . *1a. O. sergii sergii Ikonn.

—sergii Ikonnikov, 1911, Ezhegodnik Zoologicheskogo muzeya AN, XVI 268, plate V, Figure 7, Dovnar-Zapol'skii, 1933:264 James Rehn and John Rehn, 1939, Trans Amer Ent. Soc., LXV, 1057:77, tab. VI, Figures 1, 4, 5, tab. VII, Figures 8, 11, 14

b(a). Lobules of last abdominal tergite in the ♂ triangular, hardly rounded on the apex (Figure 515). ♀ ovipositor with strongly emarginate

235 ventral margin on the ventral valve which has a rather distinct little tooth before the base (Figure 516). Length of the ♂ 18.6-23.4, ♀ 29.3 mm, tegmina ♂ 16.1-18.2, ♀ 19.6 mm. —Korea. . . . . 1b. O sergii ikonnikovi Rehn et Rehn

—ikonnikovi James Rehn and John Rehn, 1939, Trans. Amer Ent. Soc , LXV, 1057:79.

38. Genus Eirenephilus Ikonn.

Ikonnikov, 1911, Ezhegodnik Zoologicheskogo muzeya AN, XVI 264, Dovnar-Zapol'skii, 1933 256, 261, 263, Berezhkov, 1937 33 Chang, 1940:37, 48 Tarbinskii, 1948:110, 111. —Podisma Shiraki, 1910.52, 69 (partim)

Eyes nearly round, vertical diameter of the eye nearly equal to its horizontal diameter and nearly equal to the subocular groove. Pronotum without lateral carinae, the length of its anterior part in the ♀ equal or hardly greater than the length of its posterior part, posterior margin broadly rounded Tegmina and wings well developed. Hind femur with a smooth dorsal carina, ventral margin of ventral genicular lobe on the outer side sinuous, ventro-apical angle of ventral lobe distinctly produced, dorsal carina without a spine on the apex Hind tibia dorsally without an outer apical spine and with 6-9 spine on the outer margin Prosternal process conical. First abdominal tergite with a large uncovered tympanal organ Last abdominal tergite in the ♂ with 2 distinct lobules on the posterior margin Cerci in both sexes conical, curved inward in the ♂, distinctly narrowed toward the apex, length of cercus in the ♂ 2.75-3 0, in the ♀ 3 times greater than its greatest width. Subgenital plate in the ♂ conical, with apex distinctly produced ♀ ovipositor with short pointed valves, these without teeth on the tip

Only one species, native to eastern Asia, is known

236 1 (1) Mesosternum in both sexes with fairly wide space between the lobes, its narrowest part in the ♂ slightly less than but in the ♀ equal to its length Lobules of last abdominal tergite in the ♂ small, triangular, basally contiguous Supraanal plate in the ♂ trapezoidal, sharply narrowing toward the apex, with distinct pointed process on the posterior

margin (Figure 517). Length of ♂ 20.8-26.1, ♀ 27.2-31.5 mm; tegmina ♂ 20.7-27.1, ♀ 25.7-31.3 mm. —Eastern Kazakhstan, southern Siberia (from Altai Territory to Maritime Territory), Sakhalin; northern Mongolia, North China: Manchuria; Korea, northern Japan. Injures various beans and also woody and shrubby vegetation (wild apple, bird-cherry, elm, alder, etc.) in Siberia and Japan (Figure 518). . . . . *1. E. longipennis (Shir.)—Wooden 'young mare' grasshopper [Kobylka drevesnaya].

Furukawa, 1939, Rep. of the first scien. exp. to Manchoukuo, Sect. V, Div. 1, Part V, 16:92, 122, 166, Figures 45^1, 47^3, 47^4, 47^5, 48^2, 49^2, 49^7, 49^8, 50^3, 50^7, 51^3, 52^3, 53^3, 54^3, 55^4, 56^2, 57^4, 58^3, 59^2, 60, 61^3, 61^6, 62^2, tab. V, Figure 2, tab. VIII, Figure 2, tab. XII, Figures 5, 6, 13; tab. XVIII, Figures 4, 9, 14, tab. XIX, Figures 2, 7, 11, 14, 16, 19, 24.—sapporense var. longipenne Shiraki, 1910-77 (Podisma).—debilis Ikonnikov, 1911, Ezhegodnik Zoologicheskogo muzeya AN, XVI:265, plate V, Figures 5-6, Dovnar-Zapol'skii, 1933:263, Figures 1, 2; Berezhkov, 1937:33, 71; Chang, 1940:50, Tarbinskii, 1948:111.—alpina subsp. niphona Furukawa, 1929, Kontyu, III, 3.171, 177; tab. V, Figures 1-5 (Podisma).

Biology: Bei-Bienko, 1932b:227; Predtechenskii, Zhdanov and Popova, 1935:117; Kuwayma and Osima, 1939, Oyo Kontyu, 1, 6:251-268.

39. Genus Fruhstorferiola Will.

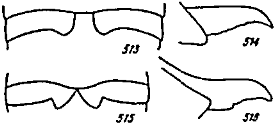
Willemse, 1922, Entom. Mitt., XI, 1:3, Ramme, 1939, Mitt. Zool. Mus. Berlin, XXIV, 1:150.—Fruhstorferia Willemse, 1921, Zool. Meded., VI:16.—Caudellacris James Rehn and John Rehn, 1939, Trans. Amer. Ent. Soc., LXV, 1057:68, 69; Chang, 1940:39, 60.

Type of genus: Fruhstorferiola tonkinensis (Will.), Viet Nam.

Eyes large, oval; vertical diameter of the eye 1.5 times larger than horizontal diameter and 1.5-twice greater than the subocular groove. Pronotum without lateral carinae; length of its anterior part 2/3 that of its posterior part; posterior margin broadly rounded. Tegmina and wings well developed, reaching or extending beyond the distal end of the hind femora. Hind femur with a smooth dorsal carina. Hind tibia dorsally without an outer apical spine. Prosternal process conical. First abdominal tergite with a large uncovered tympanic organ. Last abdominal tergite in the ♂ split in the middle with 2 distinct lobules on the posterior margin. Cerci in the ♂ strongly widened in the apical part, in the ♀ conical. Subgenital plate of the ♂ conical with distinctly produced apex; ♀ with 5 triangular teeth on the posterior margin. ♀ ovipositor with long pointed valves; apex of valves without teeth.

Four species, in southeastern China, in Viet Nam, and on the Ryuku Islands, are known.

1 (2). ♂ cerci with moderately widened apical part; length of cercus double the greatest width (Figure 519). Subgenital plate of the ♀ with slightly developed processes on the posterior margin, these situated alongside of the median triangular process which projects forward con-
237 siderably more than the processes alongside (Figure 520). Length of the ♂ 25.0-25.2, ♀ 30 mm; tegmina ♂ 15.0-15.5, ♀ 18.8-20.0 mm. —China: Hupeh, Kiangsi, Chekiang. (♀ according to Caudell and Tsai) . . . . 1. F. viridifemorata (Caud.)



Figures 513-516
(Original)

513—Ognevia sergii sergii Ikonn., ♂, posterior margin of the last abdominal tergite from above, 514—O. sergii sergii Ikonn., ♀, left ventral valve of ovipositor from the side, 515—O sergii ikonnikovi Rehn et Rehn, ♂, posterior margin of the last abdominal tergite from above, 516—O sergii ikonnikovi Rehn et Rehn, ♀, left ventral valve of ovipositor from the side.

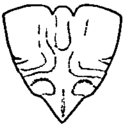


Figure 517. Eirenephilus longipennis (Shir.), ♂, anal plate. (Original)

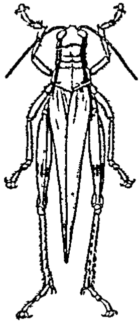
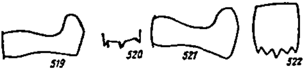


Figure 518. Eirenephilus longipennis (Shir.), ♂. (Original)



Figures 519-522 (Figure 520 according to Rehn and Rehn, the rest original)

519—Fruhstorferiola viridifemorata (Caud.), ♂, left cercus from the side, 520—F. viridifemorata (Caud), ♀, posterior margin of subgenital plate, 521—F omei (Rehn et Rehn), ♂, left cercus from the side 522—F. omei (Rehn et Rehn), ♀, subgenital plate

Tsai, 1929, Journ. Coll. Agric. Imp. Univ. Tokyo, X, 2:143, Figures 3A-C (Podisma). James Rehn and John Rehn, 1939, Trans. Amer. Ent. Soc., LXV, 1057:74, Figures 2, 5 (Caudellacris); Ramme, 1939, Mitt. Zool. Mus. Berlin, XXIV, 1:147; Chang, 1940:62, tab. II, Figure 11 (Caudellacris). — viridifemoratus Caudell, 1921, Proc. Ent. Soc. Washington, XXIII, 2:32, Figure 2 (Catantops).

2(1). ♂ cerci with strongly widened apical part; length of cercus 1.5 times greater than their greatest width (Figure 521). Subgenital plate in the ♀ with strongly developed processes on the posterior margin, situated side by side with the median triangular process which projects forward just as much as the processes standing alongside (Figure 522). Length of ♂ 24.5-27.0, ♀ 28-36 mm; tegmina ♂ 16.8-18.8, ♀ 20.8-24.5. —China: Szechwan . . . . 2. F. omei (Rehn et Rehn).

James Rehn and John Rehn, 1939, Trans. Amer. Ent. Soc., LXV, 1057:71, Figures 1, 3, 4, tab. VI, Figure 2, tab. VII, Figures 7, 12, 13 (Caudellacris); Ramme, 1939, Mitt. Zool. Mus. Berlin, XXIV, 1:150, Chang, 1940:64 (Caudellacris).

40. Genus Tonkinacris Carl

Carl, 1916, Rev. Suisse Zool., XXIV:485, Chang, 1940:38, 65.
Type of genus: Tonkinacris decoratus Carl, Viet Nam.

Eyes large, oval; vertical diameter of the eye 1.5 times greater than its horizontal diameter and 1.5-2 times greater than the subocular groove. Pronotum without lateral carinae; length of its anterior part 1.5 times greater than the length of its posterior part; posterior margin widely rounded. Tegmina and wings greatly abbreviated, not reaching the middle of the hind femora. Hind femur with a smooth dorsal carina. Hind tibia dorsally without an outer apical spine. Prosternal process conical. First abdominal tergite with a large uncovered tympanic organ. Last abdominal tergite in the ♂ split in the middle, with 2 distinct lobules on the posterior margin. Cerci in the ♂ medially compressed and either distinctly widened toward base and apex, or distinctly bent upward in the apical half; in the ♀ conical. Subgenital plate in the ♂ comical, with slightly produced apex; ♀
238 with 2 lateral rounded small processes and with a distinct triangular median tooth on the posterior margin. ♀ ovipositor with long pointed valves; apex of valves without teeth.

Two species, in southeastern China and in Viet Nam, are known.

1(1). Frontal ridge in the ♂ nearly parallel sided, slightly widened between the antennae and hardly narrowed near the middle ocellus; in the ♀ slightly but distinctly narrowed toward the clypeus. Mesosternum in both sexes with a narrow space between the lobes; its narrowest part in the ♂ 1/2 in the ♀ 2/3 its length. Cerci in the ♂ compressed [or contracted] in the middle part, distinctly curved upward in the apical part; apex of cercus rounded. Supraanal plate in the ♂ with a median lengthwise broad depression reaching its apex. ♀ ovipositor with a distinct tooth on the ventro-outer margin of the ventral lobe [sic! ? misprint for valve] close to the middle. Length of ♂ 25.0-29.5, ♀ 30.0-37.5 mm; tegmina ♂ 9.4-10.0, ♀ 10.0-12.5 mm. —China: Szechwan . . . . 1. T. sinensis Chang.

Chang, (7 Dec.) 1937, Notes Ent. Chinoise, IV, 8 191, tab. III, Figures 1-2, Chang, 1940:67. —omei John Rehn, (31 Dec.) 1937, Trans. Amer. Ent. Soc., LXIII, 1038:427, Figures 2, 3, 5.

41. Genus Indopodisma Dov.-Zap.

Dovnar-Zapol'skii, 1933:259, 263, 268, Chang, 1940:40, 67, 68 (partly).
Type of genus: Indopodisma kingdoni (Uv.).

Vertex hardly widened before the eye; its greatest width before the eyes is equal to or barely more than the width of the frontal ridge between the antennae. Eyes large, oval, vertical diameter of the eye 1.5 times greater than its horizontal diameter and 1.5 times greater than the subocular groove. Pronotum without lateral carinae, transverse grooves deep and wide, length of its anterior part 1.75-2 times greater than the length of its posterior part, posterior margin slightly triangularly emarginate near the middle carina. Tegmina hardly indicated, far from reaching the tympanic organ, or there are none of them at all. No wings. Hind femur with a smooth dorsal carina. Hind tibia dorsally without outer apical spine. Prosternal process conical. First abdominal tergite with a distinct uncovered tympanic organ. Last abdominal tergite in the ♂ split in the middle with 2 distinct slender pointed lobules on the posterior margin. ♂ cerci laterally compressed with weakly emarginate dorsal margin and with a wide obliquely truncate apex, in the ♀ conical. Subgenital plate in the ♂ conical, with distinctly produced apex, in the ♀ with a median triangular process on the posterior margin. ♀ ovipositor with long pointed valves, apex of valves without teeth.

Two species, in southeastern Tibet and in Assam, are known

1(1). Frontal ridge in both sexes strongly depressed, effaced near the clypeus, weakly widened between the antennae, weakly compressed [or constricted] near the fastigium. Vertex in both sexes depressed, weakly widened before the eyes. Mesosternum in both sexes with a trapezoidal space between the lobes, its narrowest part in the ♂ is distinctly less, but in the ♀ it is hardly more than the narrowest part of the mesosternal lobe. Supraanal plate in the ♂ triangular, with a distinct longitudinal median depression, widened close to the middle and
239 at the base, and with 2 indistinct tubercles in the basal part of the lateral margins, apex rounded. Length of ♂ 17.7-19.0, ♀ 22.7-28.0 mm, tegmina of ♂ 0.5-0.8, ♀ 0.5-1.2 mm —Southeastern Tibet, Assam .... 1. I. kingdoni (Uv.)

Uvarov, 1927, Ann. Mag. Nat. Hist., (9), XX 483, Figure (Podisma).

42. Genus Sinopodisma Chang

—Indopodisma subgen. Sinopodisma Chang, 1940:40, 68
Type of genus: Sinopodisma pieli (Chang), China (Kiangsi)

Vertex distinctly widened before the eyes; its greatest width before the eyes significantly wider than the width of the frontal ridge between the antennae. Eyes large, oval; vertical diameter of the eye 1.5 times greater than its horizontal diameter and 1.5 times greater than the subocular groove. Pronotum without lateral carinae; transverse grooves narrow, slightly depressed, sometimes nearly effaced; length of anterior part of pronotum nearly double the length of its posterior part; posterior margin slightly triangularly notched near the median carina. Tegmina lateral, reaching or extending beyond the tympanic organ. Wings hardly marked. Hind femur with a smooth dorsal carina. Hind tibia on the dorsal aspect without an external apical spine. Prosternal process conical. First abdominal tergite with well-developed open [or uncovered] tympanic organ. Last abdominal tergite in the ♂ medially split, without lobules on the posterior margin. ♂ cerci laterally compressed [or constricted], wide at the base, slightly bent inward in the apical half; apex truncate, rounded, or bi-partite; ♀ cerci conical. Subgenital plate in the ♂ conical, short, with slightly produced apex; in the ♀ with a median triangular process on the posterior margin. ♀ ovipositor with pointed valves; apex of valves without teeth. (According to Chang).

Nine species known, distributed in southeastern China and on Taiwan.

This genus was described by Chang (1940:40, 68) as a subgenus of the genus Indopodisma Dov.-Zap. But the presence in members of the subgenus Sinopodisma Chang of clear morphological characters easily differentiating this subgenus from the genus Indopodisma Dov.-Zap., makes it possible to consider it as an independent genus.

1(1). Tegmina in both sexes narrow, reaching the tympanic organ, with rounded apex; in the ♂ nearly parallel-sided, in the ♀ distinctly widened near the middle; length of a tegmen in the ♂ nearly 3 times, in the ♀ 2.5 times greater than its greatest width. Metasternum in the ♂ with very narrow space between the lobes, in the ♀ the space is transverse. Supraanal plate in the ♂ broadly triangular, with a median longitudinal depression, with 2 nearly parallel carinae in the apical part close to the median longitudinal depression, and with 2 oblique carinae in the basal part, situated close to the lateral margins; apex; rounded, hardly less than 90 degrees. ♂ cerci laterally compressed, especially in the apical part, bent dorsad, wide at the base, narrowed toward the apex; length of cercus nearly 3 times more than the greatest width; apex blunt, notched, with acute [or distinct] angles projecting forward. Hind tibiae in both sexes bluish-green. Length of ♂ 18.0-
240 22.5, ♀ 26-29 mm; tegmina ♂ 3.0-4.5, ♀ 4.5-5.3 mm. —China: Kiangsu, Chekiang . . . . 1. S. tsaii (Chang).

Chang, 1940:73,74,75, tab. I, Figure 3, tab. III, Figures 3, 4, 8, 19 (Indopodisma (Sinopodisma)).

43. Genus Dicranophyma Uv.

Uvarov, 1921, Journ. Bomb. Nat. Hist. Soc., XXVII 72, Uvarov, 1927a 169, 191.
Type of genus: Dicranophyma hingstoni Uv.

♂. Eyes irregularly oval, vertical diameter of the eye nearly 1/3 greater than its horizontal diameter. Pronotum with distinct lateral carinae, length of its anterior part twice greater than that of its posterior part at the median carina; posterior margin deeply angularly notched. Tegmina lateral, oval. Wings not developed. Hind femur with a smooth dorsal carina. Hind tibia dorsally without an external apical spine. Prosternal process transverse, wedge-shaped, distinctly incised on the apex. First abdominal tergite with a large uncovered tympanic organ. Last abdominal tergite with 2 lobules. Cerci triangular. Subgenital plate conical. (According to Uvarov).

Three species known, living in the mountains of Kashmir.

1 (2). ♂ antennae shorter than the head and pronotum combined. Hind tibiae of the ♂ light brown. Smaller. ♀ unknown. Length of ♂ 12, tegmina 2.6 mm. —Kashmir (According to Salfi) . . . 1. D. uvarovi Salfi.

Salfi, 1934, Ann Mus. Zool. R. Univ Napoli, (ser. nuova), VI, 11 9, Figure 6.

2 (1). Antennae in the ♂ longer than the head and pronotum combined. Hind tibiae of the ♂ red. Larger. Length of ♂ 17, of tegmina 3.5-4.0 mm.

3 (4). Frontal ridge in the ♂ flat. Pronotum in the ♂ with lateral carinae, interrupted by pits situated alongside them, lateral lobes convex. Lobules of last tergite of the abdomen in the ♂ triangular. ♀ not known. Length of ♂ 17, of tegmina 4 mm. —Kashmir. (According to Uvarov). . . . . .2. D. hingstoni Uv.

Uvarov, 1921, Journ. Bomb Nat Hist Soc , XXVIII 73, Uvarov, 1927a 191, 192

4 (3). Frontal ridge in the ♂ with a groove for its whole length. Pronotum in the ♂ with regular and with nearly straight lateral carinae, no pits near the lateral carinae, lateral lobes flat. Lobules of last abdominal tergite in the ♂ rounded. ♀ not known. Length of ♂ 17, of tegmina 3.5 mm. —Kashmir. (According to Uvarov) . . . . 3. D. babaulti Uv.

Uvarov, 1925, Miss. Babault Prov Centr l'Inde et l'Himalaya Orthopt., Acrididae 31, 33, Figures 10-12, Uvarov, 1927a 191, 192.

44. Genus Kingdonella Uv.

Uvarov, 1933, Ann. Mag Nat Hist , (10), XI:469 Uvarov, 1939, Linn. Soc Journ., Zool , XL, 275 566, Chang, 1940 39, 90

Type of genus Kingdonella wardi Uv.

Eyes irregularly oval, sometimes nearly round, vertical diameter of the eye equal to or 1.25-1.5 times greater than its horizontal diameter, and
241 smaller, equal to, or distinctly greater than the subocular groove. Pronotum with distinct irregular lateral carinae, usually effaced at the posterior margin, and sometimes also at the anterior margin; length of anterior part of pronotum 1.75-2 times greater than the length of the posterior part of

the pronotum at the median carina; posterior margin distinctly angularly notched. Tegmina and wings absent. Hind femur with a smooth dorsal carina. Hind tibia dorsally without an external apical spine. Prosternal process conical, with a pointed or blunted apex. First abdominal tergite without or with a small but distinct uncovered tympanic organ. Last abdominal tergite in the ♂ medially split, with or without 2 lobules on the posterior margin. ♂ cerci conical, straight, or slightly bent inward or outward, not reaching or reaching the apex of the supraanal plate; in the ♀ they are short, conical, far from reaching the apex of the supraanal plate. ♂ subgenital plate conical, usually with a slightly produced apex, sometimes the apex is not drawn out at all; in the ♀ it has a distinct median triangular process on the posterior margin. ♀ ovipositor with pointed valves, without teeth on the apex; ventral outer margin of ventral valves with a distinct tooth before the base.

Seven species known, distributed in southeastern Tibet at an altitude of 2740-4900 meters.

1 (10). No tympanic organ on the first abdominal tergite in both sexes, or it is scarcely developed.

2 (5). Supraanal plate in the ♂ flat, smooth, without teeth raised dorsad, at the middle of the lateral margins, sometimes with a fine transverse groove in the middle. Hind tibia in the ♀ dorsally purple or blackish-gray.

3 (4). Last tergite of ♂ abdomen without lobules. ♂ supraanal plate triangular, with a fine transverse groove in the middle; lateral margins weakly emarginate in the middle. ♂ subgenital plate short with apex not produced, Hind tibiae in the ♀ dorsally purple. Length of ♂ 20, ♀ 29 mm; of hind femur ♂ 11, ♀ 14 mm. —Southeastern Tibet. (According to Uvarov) . . . . 1. K. modesta Uv.

Uvarov, 1939, Linn. Soc. Journ. Zool., XL, 275.571, 574, Figure 2M, tab. 18, Figure M.

4 (3). Last abdominal tergite in the ♂ with distinct lobules. Supraanal plate in the ♂ smooth, pentagonal, without a transverse median groove; lateral margins bulged in the middle. ♂ subgenital plate longer with distinctly produced apex. Hind tibia in the ♀ dorsally blackish-gray. Length of ♂ 19, ♀ 23 mm; hind femur in the ♂ 9, ♀ 11.5 mm. —Southeastern Tibet. (According to Uvarov).2. K. saxicola Uv.

Uvarov, 1939, Linn. Soc. Journ., Zool., XL, 275 569, 573, Figure 2S, tab. 19, Figure S.

5 (2). Supraanal plate in the ♂ with teeth raised a little dorsad in the middle of the lateral margins. Hind tibia in the ♀ dorsally bright red, of a brick color, or blue-black.

6 (7). Last abdominal tergite in the ♂ with distinct pointed lobules. Supraanal plate in the ♂ without a longitudinal depression in the basal part, but with 2 teeth slightly raised dorsad at the middle of the lateral
242 margins and with 2 distinct tubercles in the apical part. Hind femur in the ♀ with a black ventral aspect. Length of ♂ 17.0-17.6, ♀ 27.8-28.0 mm; of hind femur ♂ 9.4-10.0, ♀ 12.2-13.0 mm. —Southeastern Tibet . . . . 3. K. hanburyi Uv.

Uvarov, 1939, Linn. Soc. Journ., Zool., XL, 275 567, 573, Figure 2H tab. 19, Figure H.

7 (6). Last abdominal tergite in the ♂ with very small blunt lobules. Supraanal plate in the ♂ with a distinct longitudinal depression in the basal part, with 2 teeth strongly raised dorsad at the middle of the lateral margins and without tubercles in the apical part. Hind femurs in the ♀ with a red ventral aspect.

8 (9). Eyes in both sexes irregularly oval; vertical diameter of the eye 1.5 times greater than its horizontal diameter. Prosternal process in both sexes with a pointed apex. ♀ mesosternal lobes narrow, greatest width of the lobe nearly 1.5 times greater than its greatest length. ♂ cerci slightly bent inward. Hind tibias in both sexes dorsally bright red. Length of ♂ 18, ♀ 21.0-22.6 mm, hind femur ♂ 9, ♀ 10.5-10.8 mm. —Southeastern Tibet. (♂ according to Uvarov). . . . . 4. K. wardi Uv.

Uvarov, 1933, Ann. Mag Nat. Hist, (10), XI 469, Figure., Uvarov, 1939, Linn Soc. Journ., Zool, XL, 275 573, Figure 2W, tab 19, Figure W Chang, 1940 90

9 (8). Eyes in both sexes nearly round, vertical diameter of the eye nearly equal to its horizontal diameter. Prosternal process in both sexes with a blunt apex. ♀ mesosternal lobes wide, greatest width of the lobe double its greatest length. ♂ cerci straight or slightly curved outward. Hind tibiae in both sexes blackish on the dorsal aspect. Length of the ♂ 15.2, ♀ 20 4 mm, of hind femur ♂ 7.5, ♀ 10.2 mm —Southeastern Tibet. . . . . 5. K. pictipes Uv.

Uvarov, 1935, Ann. Mat. Nat. Hist, (10), XVI 195, Figure 2 Uvarov, 1939 Linn Soc Journ., Zool, XL, 275 570, 573, Figures 2P, tab 18, Figure P Chang, 1940 91.

10 (1). Tympanic organ on the first abdominal tergite in both sexes well developed.

11 (12). *Last abdominal tergite in the ♂ with very small rounded lobules.* Supraanal plate in the ♂ wide, its greatest length slightly greater than its greatest width, with small teeth raised dorsad at the middle of the lateral margin and with distinctly projecting median process on the posterior margin. ♂ cerci short, straight, length of cerci 2.25 times greater than the greatest width. Hind femur in the ♀ with a red base on the inner margin on the ventral aspect. Length ♂ 22, ♀ 26.0-27.6 mm, of hind femur ♂ 12, ♀ 12.6-13.0 mm. —Southeastern Tibet. (♂ according to Uvarov) . . . . 6. K. gentiana Uv

Uvarov, 1939, Linn. Soc Journ., Zool, XL, 275 566, 573, Figure 2G, tab. 19, Figure G

12 (11). Last abdominal tergite in the ♂ with distinct pointed lobules. Supraanal plate in the ♂ long and narrow, its greatest length 1.5 times great-
. 43 er than its greatest width, without raised teeth near the middle of the lateral carinae and with triangularly depressed posterior margin ♂ cerci long, slender, bent inward, length of one of them 3 times greater than its greatest width. Hind femur in the ♀ without

a red spot near the base of the unicolored blue-black ventral aspect. Length of the ♂ 21.2-22.0, ♀ 32.7-35.0 mm; of hind femur ♂ 10.4-11.0, ♀ 13.5-14.3 mm. —Southeastern Tibet.7. K. kaulbacki Uv.

Uvarov, 1939, Linn. Soc. Journ., Zool., XL, 275-570, 573, Figure 2K, tab. 18, Figure K.

45. Genus Schistocerca Stål

Stål, 1873, Recens. Orth., I 64; Jakobson, 1905:173, 203, 308, Kirby, 1914:193, 232; Uvarov, 1923, 141, Uvarov, 1923 483, Uvarov, 1927a:167, 189, Tarbinskii, 1940.21, 148.
Type of genus: Schistocerca gregaria (Fōrsk.) (=S. peregrina Ol.).

Eyes oval; vertical diameter of the eye nearly 1.5 times greater than its horizontal diameter and considerably greater than the subocular groove. Frontal ridge slightly widened above the median ocellus, distinctly wider than immediately under it. Pronotum with a low median carina, which is nearly effaced in the anterior part. Tegmina and wings well developed; wings without a median dark band. Hind femur with a finely dentate dorsal carina. Hind tibia dorsally without external apical spine. Prosternal process cone-like or cylindrical, very rarely slightly curved toward the mesosternum. Mesosternum with elongate lobes; the length of a lobe distinctly greater than its greatest width. ♂ subgenital plate apically with a distinct triangular median incision.

About 80 species are known, living chiefly in Central and South America; only one species lives in the Old World, being distributed in Africa and in southwestern Asia.

1 (1). Pronotum strongly compressed in the anterior part. Tegmina long extending beyond the apex of the hind tibiae, with numerous blackish-brown spots. Wings colorless. ♂ supraanal plate triangular, with sinuous lateral margins and sharp posterior angles. ♂ cerci wide, slightly tapered toward the notched apex. Length ♂ 45.8-55.3, ♀ 50.7-61.0 mm; tegmina ♂ 44.6-60.5, ♀ 52.9-63.8 mm. —The region of constant habitation includes the very southern regions of the Sahara and the Sudan south to Kenya and Tanganyika, the Sinai Peninsula, Arabia, southern Iran, western Pakistan, and the desert regions of northwestern India, whence they make periodical flights, sometimes flying into southern Europe, the Transcaucasia, and Middle Asia. In the territory of the U. S. S. R. there were mass flights into Transcaucasia in 1928 and 1930 and into Middle Asia in 1929, where they caused great damage to cultivated plants of various kinds, especially cotton. Outside the boundaries of the U. S. S. R. it greatly injures different grain, truck, melon, and industrial crops, fruit trees and also wild trees, predominantly undergrowth and woody vegetation. A gregarious species; for the difference between the gregarious and the solitary phases, see page 257 . . . .
*1. S. gregaria (Fōrsk.)—Desert locust [Sarancha pustynnaya].

Uvarov, 1923 484, Uvarov, 1927a:189, Figures 210-211, 249-251, Uvarov, 1929, Pustynnaya saranch (Desert locust):1-148, Figures 1-4, Tarbinskii, 1940 21, 224, Figures 120, 130. —gregarius Fōrskal, 1775, Descriptiones Animalium, etc. 81 (Gryllus). —peregrinum Olivier, 1804, Voyage dans l'Empire Otto-

 man, etc., IV 388 (Acridium) —flaviventre Burmeister, 1838, Handb Ent., II 631 (Acridium). — peregrina Jakobson, 1905 203, 308. —tatarica Kirby, 1914 232, Figure 128 (nec Linnaeus).

Biology Moritz, 1928, Materialy obsledovaniya saranchevykh severnoi Persii, Ashkhabad, 19-32, Telenga, 1930, Izvestiya Khorezmskoi sel'skokhozyaistvennoi opytnoi stantsii, VI 1-27, Bei-Bienko, 1932b: 29, 227, 387, Predtechenskii, 1935a 1-91, Predtechenskii, 1935b 1-134, Predtechenskii, Zhdanov and Popova, 1935 39-43, Husain and Mathur, 1936 591-623, Zimin, 1938 38, 76, tabl VII, Figure 37, Kennedy, 1939 385-542, Mishchenko, 1949b-165

Key to Phases

a(b). Pronotum wide, width of its posterior part greater than its length, median carina hardly perceptible in the anterior part; posterior angle considerably greater than 90 degrees, broadly rounded. Coloring of individuals that have recently grown their wings pale rose, the sexually mature are bright yellow . . . .
. *1a. S. gregaria (Forsk.) ph. gregaria-Gregarious phase.

Uvarov, 1927a 189, Figure 249, Uvarov, 1929, Pustynnaya sarancha, 6, Figure 2C.

b(a). Pronotum narrower, width of its posterior part nearly equal to its length, median carina distinct in the anterior part, posterior angle nearly equal to 90 degrees, slightly rounded. Coloring of individuals that have recently grown their wings pale greenish, the sexually mature are gray or yellowish-gray, with dark lateral bands on the pronotum and with a distinct light band along its middle . . . .
. . .*1b. S. gregaria (Forsk.) ph. solitaria—Solitary phase.

Uvarov, 1927a 189, Figures 250-251, Uvarov, 1929, Pustynnaya sarancha, 6 Figure 20 —flaviventre Burmeister, 1838, Handb. Ent., II 631 (Acridium)

46. Genus Anacridium Uv.

Uvarov, 1923 141, Uvarov, 1923 485 Uvarov, 1925c 86, 88 Uvarov, 1927a 167, 174 Tarbinskii, 1940 20, 148, 153 Tarbinskii, 1948 109 110 —Acridium Jakobson 1905 173, 202, 307 (partim), Obenberger, 1926 64, 100 —Orthacanthacris Kirby 1914 193 224 (partim).

Type of genus Anacridium aegyptium (L.)

Eyes oval, vertical diameter of the eye almost twice greater than its horizontal diameter and considerably greater than the subocular groove. Frontal ridge slightly widened above the median ocellus, distinctly wider than immediately above [sic' ? misprint for under] it. Pronotum with a high median carina which is raised like a crest in the anterior part. Tegmina and wings well developed. Wings with a smoky median band. Hind femur with a finely dentate dorsal carina. Hind tibias dorsally without the external apical spine. Prosternal process conical, straight. Mesosternum with elongate lobes; the length of a lobe is distinctly greater than its greatest width. ♂ subgenital plate trilobate, with 2 rounded notches on the apex.

Five species known, distributed in Africa, southern Europe, western and southern Asia, and on islands of the Malay Archipelago

1 (1). Pronotum strongly rugose with distinct separate smooth granules; length of its anterior part nearly equal to its posterior part. Mesosternum with a heart-shaped space between the lobes; its greatest width considerably less than its length. Hind tibiae dorsally with yellow or red spines; apex of spines black. . *1. A. aegyptium (L.)—Egyptian 'young mare' grasshopper [Kobylka egipetskaya].

a(b). Hind tibiae in both sexes with yellow internal spines; apex of spines black. Length ♂ 32.0-56.2, ♀ 47.4-66.4 mm; tegmina ♂ 37.5-57.1, ♀ 46.5-66.2 mm. —South European part of the U.S.S.R., the Caucasus, southern Kazakhstan, Middle Asia; North Africa, southwestern Europe, Hither Asia, Iran, northern Afghanistan, Punjab (?). Slightly injures volatile-oil plants, different vegetables and industrial crops, grape vines, different fruit trees, and also wild shrub and tree vegetation. . . . . *1a. A. aegyptium aegyptium (L.)

—aegyptius Linnaeus, 1764, Mus. S.R.M. Ludovicae Ulricae Reginae, etc. :136 (Gryllus Locusta). —lineola Fabricius, 1781, Species insectorum, I·365 (Gryllus). —nubecula Thunberg, 1815, Mem. Acad. Sci. St.-Pétersb., (5), V:238 (Gryllus). —appulum Costa, 1836, Fauna del Regno di Napoli, Ortotteri:44, tab. IV, Figures 4 (larva) (Podisma) (partim). —companum Costa, 1836, ibid. :47, tab. IV, Figures 5A, b-d (Podisma). —tataricum Burmeister, 1838, Handb. Ent., II.632 (Acridium) (nec Linnaeus). —indecisum Walker, 1870, Cat. Derm. Salt. Brit. Mus., III:585 (Acridium). —albidiferum Walker, 1870, ibid., IV·627 (Acridium). —aegyptium Jakobson, 1905 203, 307, Figure 25, plate VII (Acridium). Obenberger, 1926 100, tab. III, Figure 130 (Acridium), Uvarov, 1927a·188, Figures 201, 207, 209, Uvarov, 1927b 288, Figure 104, Tarbinskii, 1940:20, 153, 225, Tarbinskii, 1948:110, Figure 139A. — aegyptia Kirby, 1914 224, 225 (Orthacanthacris).

Biology: Grassé, 1922, Bull. bio.. France et Belgique, LVI·544-578 (as Orthacanthacris aegyptia), Fedorov, 1927, Trans. Ent. Soc. Lond., I·53-61; Bei-Bienko, 1932b 29, 226; Predtechenskii, Zhdanov and Popova, 1935 93, 136, 137, Zimin, 1938; 38, 77; Mishchenko, 1949b 166.

b(a). Internal spines of hind tibiae in both sexes red inside; apex of spines black. Length ♂ 42.5-51.5, ♀ 63.4-72.3 mm; tegmina ♂ 51.5-52.4, ♀ 68.0-72.5 mm. —Eastern Afghanistan, northwestern Pakistan . . . . 1b. A. aegyptium rubrispinum B.-Bienko.

Bei-Bienko, 1948, Doklady AN SSSR, (novaya seriya), LX, 3 499.

47. Genus Pachyacris Uv.

Uvarov, 1923 140, Uvarov, 1923 477, Tinkham, 1940 338, 340. —Orthacanthacris Kirby, 1914 193, 224 (partly).

Type of genus: Pachyacris violascens (Walk.), Ceylon.

Eyes oval; vertical diameter of the eye nearly 1.75 times greater than its horizontal diameter and considerably greater than the subocular groove. Frontal ridge not widened above the median ocellus, its margins nearly parallel to each other. Pronotum with a rather high pectinate median carina which is distinct for its whole extent. Tegmina well developed, reaching far beyond the distal end of the hind femara, with oblique venation in the apical part; the cross veins are situated obliquely to the main veins. Wings well developed, without dark median band. Hind femur with finely

 dentate dorsal carina. Hind tibia dorsally without external apical spine and with 7-8 spines on the outer margin. Prosternal process conical. Mesosternum with elongate lobes, the length of a lobe is distinctly greater than its greatest width. ♂ subgenital plate conical, pointed.

Three species known, living in Ceylon and southeastern Asia.

1 (1). Frontal ridge in both sexes flat in the dorsal part with large points; depressed in the ventral part. Antennae light in both sexes. Pronotum in both sexes with coarse points and distinct rugae. Tegmina in both sexes without a median spurious vein in the median and cubital fields. Mesosternum in the ♀ with a trapezoidal space between the lobes, its greatest width slightly less than its length. Length of ♀ 50-60, tegmina 50.6-61.2 mm. Dimensions of the body in the ♂ unknown. —Northern India, Nepal, Assam, Burma, western and southeastern China . . . . 1. P. vinosa (Walk.)

Kirby, 1914 228 (Orthacanthacris) Uvarov, 1923 478, Figure 6a, Tinkham, 1940 341, tab. XIII, Figure 18. —vinosum Walker, 1870, Cat Derm Salt. Brit. Mus , III 588 (Acridium) —wingatei Kirby, 1900, Ann Mag Nat. Hist., (7), VI 381 (Cyrtacanthacris).

48. Genus Valanga Uv.

Uvarov, 1923 143, Uvarov, 1923 345 —Acridium Jakobson, 1905 173, 202, 307 (partim).—Orthacanthacris Kirby, 1914 193, 224 (partim).

Type of genus: Valanga nigricornis (Burm.), southeastern Asia and the Malay Archipelago, Australia

Eyes oval, vertical diameter nearly twice the horizontal diameter and considerably greater than the subocular groove. Frontal ridge not widened above the median ocellus, its margins nearly parallel to each other. Pronotum with a high median carina. Tegmina well developed, reaching far beyond the distal end of the hind femora, with straight venation in the apical part, cross-veins form almost a right angle with the main veins. Wings well developed, usually smoky. Hind femur with a finely dentate dorsal carina, it is short and wide, length of femur nearly 4.5 times greater than its greatest width. Hind tibia dorsally without an external apical spine and with 8 spines along the external margin. Prosternal process nearly cylindrical, with a pointed apex, slightly sloping caudad. Mesosternum with elongated lobes, the length of a lobe is distinctly greater than its width. ♂ cerci wide at the base, abruptly narrowed at the apex. ♂ subgenital plate conical, pointed, without notches on the apex

About 30 species are known, chiefly distributed on the islands of the Malay Archipelago, in the Philippine Islands, and in Australia, one species lives in southeastern Asia.

1 (1). Anterior part of vertex in the ♀ hexagonal. Pronotum in the ♀ somewhat rough, its posterior angle strongly rounded. Tegmina in the ♀ ash-colored, with numerous faintly darkened dots some of which make incomplete bands. ♂ unknown. Length of ♀ 65 mm. —Korea. (According to Walker) . . . . 1. V. nigricornis fumosa (Walk.)

Uvarov, 1923 348, 354 —fumosum Walker, 1870, Cat Derm Salt Brit Mus , III 589 (Acridium) Jakobson, 1905 308 (Acridium)

49. Genus Patanga Uv.

Uvarov, 1923.143, Uvarov, 1923·362, Tinkham, 1940.338, 341. —Acridium Jakobson, 1905:173, 202, 307 (partim), Shiraki, 1910.51, 63 (partim).—Orthacanthacris Kirby, 1914:193, 224 (partim).

Type of genus: Patanga succincta (Johan).

Eyes oval; vertical diameter of the eye nearly twice greater than its horizontal diameter and considerably greater than the subocular groove. Frontal ridge not widened above the median ocellus, its margins nearly parallel to each other. Pronotum with a low median carina. Tegmina well developed extending far beyond the distal end of the hind femora with straight venation in the distal part; transverse veins form almost a right angle with the principal veins. Wings well developed. Hind femur long and narrow, with a finely-dentate dorsal carina; length of a femur 5.5-6 times greater than its greatest width. Hind tibia dorsally without external apical spine and with 8 spines on the outer margin. Prothoracic process nearly cylindrical, with slightly pointed apex, straight or slightly sloping caudad. Mesosternum with elongate lobes; the length of a lobe distinctly greater than its greatest width. ♂ cerci narrow at the base, slightly and gradually narrowed toward the apex. ♂ subgenital plate conical, pointed, without notches on the apex.

Five species known, distributed chiefly in southeastern Asia and on islands of the Malay Archipelago; one species enters Australia (?); one lives on the Galapagos Islands.

1 (2). Body ventrally with long dense hairs. Frons densely and coarsely punctate. Tegmina reaching only the middle of the hind tibias, if the latter are drawn out straight caudad. Wings basally rosy, apically smoky. Prosternal process blunted, weakly swollen before the apex. Length of ♂ 34.8-38.4, ♀ 39.5-49.5 mm; tegmen ♂ 32.3-37.2, ♀ 36.5-48.4 mm. —Northern India, Sikkim, East China, Korea, Japan. . . . . 1. P. japonica (I. Bol.)

Kirby, 1914 225, 229 (Orthacanthacris), Uvarov, 1923 364, Figure 3c Tinkham, 1940.342, 343, tab. XIII, Figure 20. —japonicum I. Bolivar, 1898, Ann. Mus. Civ. Stor Nat Genova, (2), XIX (XXXIX)·98 (Acridium), Jakobson, 1905 203, 308 (Acridium), Shiraki, 1910 64, 67 (Acridium) —japonica var. immaculata Sjostedt, 1933, Ark. Zool., 25 A, No. 3.32.

2 (1). Body ventrally with sparse hairs. Frons sparsely and finely punctate. Tegmina extending beyond the middle of the hind tibiae, if the latter are drawn out straight caudad. Wings basally rosy-violet or colorless, apically colorless. Prosternal process slightly swollen in the middle part, narrowed toward the base and toward the pointed apex. Length ♂ 42.8-48.1, ♀ 55.7-61.4 mm; tegmina ♂ 46.4-52.1, ♀ 63.6-70.2 mm. —India, southeastern Asia, Islands of the Malay Archipelago, Philippine Islands, Australia (?). Sometimes greatly injures many cultivated and wild plants . . . . 2. P. succincta (Johan.)—Indian locust [Sarancha indiiskaya].

Kirby, 1914 225, 227, Figure 125 (legend below figure Orthacanthacris flavescens) (Orthacanthacris) Uvarov, 1923 364, 365, Figures 1C, 2d, 3d, 7b, 8A, 8B Tinkham, 1940·342, tab XIII, Figure 19. —succinctus Johannson, 1763, Amoenitates Academicae etc., VI 398 (Gryllus Locusta).—

assectator Fischer, Waldheim, 1846 235, tab XIII, Figure 2 (Acridium). —fisilinea Walker, 1870, Cat Derm. Salt. Brit. Mus , III 564 (Cyrtacanthacris) —inficita Walker, 1870, Ibid ,565 (Cyrtacanthacris) —rubescens Walker, 1870, ibid .588 (Acridium) —elongatum Walker, 1870, ibid.; IV 636 (Acridium) —peregrina Jakobson, 1905:308 (Acridium, partly) —succinctum Shiraki, 1910 64, 65 (Acridium). —succinctus var sternocardias I Bolivar, 1914, Journ Straits Branch R Asiat Soc , 67 88 (Cyrtacanthacris)

Biology Lefroy, 1906, Mém. Dept. Agric India. Ent. Ser., IV:1-109, Sorauer, 1925, Handb d. Pflanzenkrankheiten, 4 Ausg., IV 227.

50. Genus Chondracris Uv.

Uvarov, 1923 144 Uvarov, 1924 105, Tinkham, 1940 338, 339 —Acridium Jakobson, 1905 173, 202, 307 (partly) Shiraki, 1910 51, 63 (partly) —Cyrtacanthacris Kirby, 1914 193, 230 (partly)

Type of genus Chondracris rosea (De Geer)

Eyes oval, vertical diameter of the eye 1.5-1.75 times greater than its horizontal diameter and in the ♂ greater than the subocular groove, in the ♀ inconsiderably less than the latter. Pronotum with a high pectinate median carina. Tegmina and wings well developed. Hind femur with a finely dentate dorsal carina. Hind tibia dorsally without external apical spine. Prosternal process angularly bent toward the mesosternum, its preapical part more or less widened, the apex blunt. Mesosternum with elongate lobes, the length of a lobe is distinctly greater than its greatest width. ♂ cerci conical. ♂ subgenital plate conical, pointed

Five species known, distributed in Africa, in southeastern Asia, on islands of the Malay Archipelago, and in the Philippines

1 (1). Wings basally rosy-violet, apically colorless. Hind femur with yellow inner and ventral aspects. Hind tibia reddish Mesosternum with a heart-shaped space between the lobes, its greatest width distinctly less than its length. Length ♂ 48.9-59.7, ♀ 64.7-85.1 mm, tegmina ♂ 47.6-52.2, ♀ 62.7-74.3 mm. —Korea, East China (north to Manchuria), Taiwan, Japan. Injures cotton, sugar-cane, and other plants on Taiwan and continental China . . . . . . 1 Ch. rosea (De Geer).

Kirby, 1914 230, 231, Figure 126, (legend below figure Orthacanthacris succinata) (Cyrtacanthacris partly) Uvarov, 1924 106, 108 Tinkham, 1940 339, tab XIII, Figure 17 —roseum De Geer, 1773, Memoires pour servir a l'histoire des Insectes III 488, tab 41, Figure 1 (Acridium) Jakobson, 1905 203, 307 (Acridium) —flavicornis Fabricius, 1787, Mantissa insectorum etc , I 237 (Gryllus) —lutescens Walker, 1870, Cat Derm Salt Brit Mus , III 566 (Cyrtacanthacris) —flavicorne Shiraki, 1910 64, tab II, Figures 11a c (Acridium, partim)

Biology Sorauer, 1925, Handb d Pflanzenkrankheiten, 4 Ausg , IV 228

51. Genus Kabulia Rme.

Ramme, 1928 Deutsch Ent Zeit 300 Uvarov, 1931 223.

Type of genus Kabulia afghana Rme.

Eyes oval, vertical diameter of the eye 1.75-2 times greater than its horizontal diameter and considerably greater than the subocular groove.

249 Pronotum without lateral carinae, sometimes they are hardly perceptible

in the anterior part. Tegmina greatly shortened, lateral, lobe-like. Wings greatly shortened or absent (?). Hind femur with finely-dentate dorsal carina. Hind tibia dorsally without external apical spine and with 8-9 spines along the external margin. Prosternal process long, pointed. Mesosternum with wide lobes; length of a lobe equal to or distinctly less than its greatest width. ♀ ovipositor with short valves.

Five species known, living in the mountains of Afghanistan and north-western Pakistan.

1(2). ♀ tegmina only reaching the posterior margin of the first abdominal tergite. ♀ ovipositor along the ventro-external margin of the ventral valves with a distinct tooth at the base (Figure 523). ♂ unknown. Length of ♀ 32, tegmina 5 mm. —Afghanistan: Doshi on the Kabul-Mazar-i-Sharif road. . . . . 1. K. kostylevi B.-Bienko.

Bei-Bienko, 1949, Doklady AN SSSR, (novaya seriya), LXVII, 1:175, Figure 1k.

2(1). ♀ tegmina distinctly extending beyond the posterior margin of the first abdominal tergite. ♀ ovipositor rounded on the ventro-external margin of the ventral valves, without a tooth at the base. ♂ unknown. Length of ♀ 39, tegmina 7 mm. —Afghanistan: Pegman Range. (According to Ramme and Uvarov). . . . . 2. K. afghana Rme.

Ramme, 1928, Deutsch. Ent. Zeit.:301, Figure, tab. VII, Figures 1a-b; Uvarov, 1931:224, Figures 1a, 2a.

52. Genus Traulia Stål

Stål, 1873, Recens. Orth., 1:37, 58, Shiraki, 1910:52, 68; Kirby, 1914:193, 244, C. Bolivar, 1917:606; Tinkham, 1940:316, Ramme, 1941, Mitt. Zool. Mus. Berlin, XXV, 1:181.
Type of genus: Traulia flavo-annulata (Stål), Java.

Frontal ridge in profile strongly depressed anteriorly between the antennae. Vertex wide; its width between the eyes twice more than the width of the frontal ridge between the antennae. Eyes oval; vertical diameter of eye 1.75-2 times greater than its horizontal diameter and considerably greater than the subocular groove. ♂ antennae short and stout, 1.5 times longer than head and pronotum combined. Pronotum without lateral carinae. Tegmina and wings either well developed or abbreviated, but always extending beyond the base of the hind femur. Hind femur with a fine-toothed dorsal carina. Hind tibia dorsally without external apical spine and with 7-8 spines on the outer margin. Prosternal process conical, with pointed apex. Mesosternum with wide lobes; length of a lobe equal to or distinctly less than its greatest width. Metasternum with distinctly separated lobes in the posterior part. ♀ ovipositor with moderately long valves.

About 40 species are known, living in southeastern Asia, on Taiwan, on the islands of the Malay Archipelago, and in the Philippines.

250 1(1). Antennae in both sexes light. Tegmina in both sexes slightly shortened, distinctly reaching beyond the middle of the hind femora. Wings in both sexes darkened at the apex. Hind tibia in both sexes black in

the basal half, with a white ring before the base, red in the apical half. ♂ cerci medially compressed, widened toward base and apex which is distinctly produced. Length of ♂ 25.4-28.0, ♀ 34-38 mm; tegmina ♂ 14.3-14.5, ♀ 10.0-19.3 mm. —China: Szechwan. (♀ according to Ramme). . . . . 1. T. orientalis szetschuanensis Rme.

Ramme, 1941, Mitt. Zool. Mus Berlin, XXV 189, tab. XIX, Figure 3.

53. Genus Apalacris Walk.

Walker, 1870, Cat. Derm Salt. Brit. Mus., IV 641, Kirby, 1914 194, 237, Uvarov, 1935, Lingn Sci. Journ., XIV, 2 269, Tinkham, 1940 322, 334. —Eucoptacra Willemse, 1930, Tijdschr Ent, LXXIII, 62 105, 169 (nec I. Bolivar).

Type of genus: Apalacris varicornis Walk.

Frontal ridge in both sexes in profile nearly flat between the antennae, hardly projecting in front. Vertex narrow; its width between the eyes nearly equal to the width of the frontal ridge between the antennae. Eyes oval. Antennae in the ♂ long and slender, 3 times longer than head and pronotum combined. Pronotum without lateral carinae. Tegmina and wings well developed, nearly reaching or extending beyond the distal end of the hind femora. Hind femur with a finely dentate dorsal carina. Hind tibia dorsally without the external apical spine and with 8-10 spines on the outer margin. Prosternal process conical, with pointed apex. Mesosternum with wide lobes, length of a lobe equal to or distinctly less than its greatest width. Metasternum with distinctly separated lobes in the posterior part. (According to Walker and Kirby).

Seven species known, living in southern and southeastern Asia including the islands.

1(1). Frontal ridge narrow, with straight parallel margins. Antennae with a light dorsal end. Pronotum punctately granulate, with 3 transverse grooves; the posterior transverse groove extending along beyond its middle. Hind femur dorsally with 3 black bands. (According to Walker and Kirby). Length of ♂ 15-18, ♀ 23-25 mm, tegmina ♂ 14, ♀ 17-19 mm. —North India, Assam, Annam, Burma, Malacca Peninsula, southeastern China, Viet Nam, Sumatra, Borneo, Japan. . . . . .1. A. varicornis Walk.

Walker, 1870, Cat. Derm Salt Brit. Mus, IV 642, Kirby, 1914 238, Figure 130, Uvarov, 1935, Lingn. Sci. Journ., XIV, 2 269, Tinkham, 1940 334, —cingulatipes I. Bolivar, 1898, Ann. Mus Civ Stor. Nat. Genova, (2), XIX (XXXIX) 99 (Coptacra), Willemse, 1930, Tijdschr Ent, LXXIII, 62 171, Figure 89 (Eucoptacra). —sumatrensis Fritze, 1899, Rev Suisse Zool., VII 339 (Coptacra)

54. Genus Catantops Schaum

Schaum, Orthoptera, in Peters, 1862, Naturwissenschaftliche Reise nach Mossambique etc, Zoologie, V 134, Shiraki, 1910 52, 78 Kirby, 1914 194, 246, Tinkham, 1940:344. —Acridium Jakobson, 1905 173, 203, 307 (partim).

Type of genus: Catantops melanostictus Schaum, Mosambique.

Eyes irregularly oval; vertical diameter of the eye nearly twice its horizontal diameter and 2-3 times more than the subocular groove. Pronotum with a low linear median carina and without lateral carinae. Tegmina and wings well developed. Hind femur with a dentate dorsal carina. Hind tibia dorsally without the external apical spine and with 8-9 spines along the outer margin. Prosternal process nearly cylindrical, sometimes slightly widened at the apex. Mesosternal lobes wide and short; length of a lobe equal to or considerably less than its greatest width. Metasternal lobes contiguous in the posterior part. ♀ ovipositor with short pointed valves.

About 170 species are known, widely distributed in Africa, in southern and eastern Asia, on the islands of the Malay Archipelago, in the Philippines, and in Australia.

1 (2). Antennae long and slender; length of a single median antennal segment twice its greatest width. Hind femur slender and narrow; length of femur 4.2-4.8 times greater than its greatest width; dorsal aspect aspect without dark transverse bands. Mesosternum with very narrow space; its narrowest part is 1/7 to 1/8 its length. ♂ cerci conical pointed (Figure 524). Length of ♂ 27.8-30.4, ♀ 37.0-44.2 mm; tegmina ♂ 27.5-28.5, ♀ 36.0-37.3 mm. —Korea, East China, Taiwan, India, Malacca Peninsula, islands of the Malay Archipelago, and the Philippines . . . . 1. C. splendens (Thunb.)

Thunberg, 1815, Mém. Acad. Sci. St.-Pétersb., (5), V 236 (Gryllus), Shiraki, 1910-78, Kirby, 1914 247, 250, Tinkham, 1940:344. —luteolum Serville, 1839, Hist. Nat. Ins. Orth. :661 (Acridium). —infuscatum Haan, 1842, Verh. Nat. Gesch. Nederl. Overz. Bezitt., Zool. :155, 156 (Acridium (Oxya)]. —rufitibia Walker, 1859, Ann. Mag. Nat. Hist., (3), IV-223 (Acridium). —nana Walker, 1870, Cat. Derm. Salt. Brit. Mus., III-568 (Cyrtacanthacris). —ferrina Walker, 1870, ibid. :568 (Cyrtacanthacris). —ceramicum Walker, 1870, ibid. -591 (Acridium). —tenella Walker, 1870, ibid., IV: 618 (Cyrtacanthacris). — ?coreanum Walker, 1870, ibid., IV.618 (Cyrtacanthacris). — coreanum Walker, 1870, ibid., IV-629 (Acridium), Jakobson, 1905:308 (Acridium). —obliqua Walker, 1871, ibid., V, Suppl. :58 (Cyrtacanthacris). —splendens var. pallipes Karny, 1907, Sitz. Akad. Wissen. Wien. Math.-nat. Kl., Abt. I, CXVI.311, 326. —splendens var. vitrea Karny, 1907, ibid. :326.

2 (1). Antennae short and stout; length of a single median antennal segment equal to or 1.25-1.5 times greater than its greatest width. Hind femur shorter and wide, length of femur 3.4-3.6 times greater than its greatest width; dorsal aspect with 2-3 dark transverse bands. Mesosternum with a wider space, its narrowest part 1/4-1/3 its length.

3 (4). Frontal ridge in both sexes distinctly depressed for all its length. Hind femur in both sexes externally with 2 complete transverse bands, situated between the inner carinae. ♂ cerci conical, pointed (Figure 525). Length of ♂ 18.0-21.2, ♀ 24-27 mm; tegmina ♂ 16.0-17.6, ♀ 21-23 mm. —China: Kansu, Kiangsu, Szechwan, Hupeh, Fukien, Kwangsi, Kwangtung, Hainan Island . . . 2. C. brachycerus Will.

Willemse, 1932, Natuurh. Maandblad., XXI, 8:106, Tinkham, 1940-344, 346.

252 4 (3). Frontal ridge in both sexes slightly depressed only in the ventral part. Hind femur in both sexes on the outer side either with only one incomplete transverse dark band, situated at the dorso-internal margin,

or without any band at all. ♂ cerci medially compressed, distinctly widened toward the base and apex (Figures 526, 527).

5(6). Antennae in both sexes longer and more slender, the length of a single median segment of the antenna 1.25-1.5 times more than its greatest width. Pronotum in both sexes with small [fine]† punctation and hardly perceptible rugae. Mesosternal lobes in both sexes nearly quadrate, greatest width of a lobe equal to its length. ♂ cerci greatly widened at the base; the width of a cercus at its base is twice more than the greatest width at its apex (Figure 526). Length ♂ 26.4-27.0, ♀ 28.6-34.0 mm; tegmina ♂ 22.0-23.5, ♀ 28.3-32.6 mm. —Northern India, Ceylon, Sikkim, Burma, Japan (?), China· Szechwan, Hupeh, Fukien, Kwangsi, Kwangtung, Hainan Island 3. C. pinguis (Stål).

Kirby, 1914 252, Tinkham, 1940 344, 346, Uvarov, 1943b 120, 127, Figure 13 —pingue Stål, 1860, Kongl. Fregatten Eugenies Res. Zool., V. Orth. 330 (Acridium). —delineolatum Walker, 1870, Cat. Derm. Salt. Brit. Mus , IV 631 (Acridium). —signatipes Walker, 1870, ibid :706 (Calopteenus)

6(5). Antennae in both sexes stouter and shorter; length of a single median segment of the antenna equal to its greatest width. Pronotum in both sexes with large coarse punctures and fine rugae. Mesosternal lobes in both sexes wide, the greatest width of a lobe is distinctly more than its length. ♂ cerci slightly widened at the base; width of a cercus at its base hardly more than the greatest width at its apex. (Figure 527). Length ♂ 22.5-25.3, ♀ 31.4-38.5 mm, tegmina ♂ 20.6-21.2, ♀ 29.3-30.5 mm. —Afghanistan, India (north to Kashmir), Ceylon, China, Korea (?). In India it injures young tea plants and pines . . . . 4. C. innotabilis (Walk.)

Uvarov, 1925, Miss Babault Prov Centrales de l Inde et l'Himalaya, Orthopt., Acrididae 30, Uvarov, 1943b 120, 127, Figure 14 —innotabile Walker, 1870, Cat. Derm Salt. Brit Mus , IV·629 (Acridium). —ferrugineus Walker, 1870, ibid. 705 (Calopteenus) —obtusiferum Walker, 1871, ibid , V, Suppl. 63 (Acridium). —immunis Walker, 1871, ibid , V, Suppl. :67 (Calopteenus) —indicus I Bolivar, 1902, Ann. Soc. Ent. France, LXX 626, Kirby, 1914 247, 251 —humilis Kirby, 1914 247, 250 (partim).

Biology· Sorauer, 1925, Handb. d. Pflanzenkrankheiten, 4 Ausg , IV 229.

253 55. Genus Paracaloptenus I. Bol.

I Bolivar, 1876, An. Soc. Esp Hist. Nat , V 296, Jakobson, 1905 173, 205, 318 Chopard, 1922 172, Uvarov, 1925c 87, 90 Obenberger, 1926 64, 99 Tarbinskii, 1927 50, 69 Uvarov, 1942 Proc R Ent. Soc. Lond , (B), XI, 6 86, Tarbinskii, 1948 110 —Caloptenus Brunner-Wattenwyl, 1882 86, 216 (partim).

Type of genus Paracaloptenus caloptenoides (Br.-W.) (= P. typus I. Bol., partim).

Eyes regularly oval, vertical diameter of the eye 1.5-2 times greater than its horizontal diameter and 1.5-2 times greater than the subocular groove. Pronotum with sharp lateral margins Tegmina strongly abbreviated, lateral. Wings hardly perceptible or slightly developed. Hind femur

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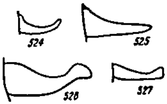
† [The Russian adjective used here usually means delicate, tender, soft, gentle, etc The somewhat analogous "fine" is used here after "small", as large, coarse, are the corresponding adjectives in the second half of the key]

Figure 523. Kabulia kostylevi B.-Bienko, ♀, left ventral valve of ovipositor from the side.



Figures 524-527. Left cercus in ♂ from the side. (Original)

524—Catantops splendens (Thunb.), 525—C. brachycerus Will.; 526—C. pinguis (Stål), 527—C. innotabilis (Walk.).

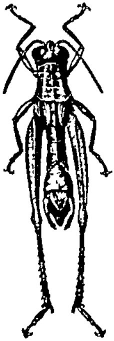


Figure 528. Paracaloptenus caloptenoides (Br.-W.), ♂. (Original)

with a finely dentate dorsal carina, rather slender; length of femur nearly 4 times its greatest width. Hind tibia dorsally without the external apical spine. Prosternal process laterally compressed, slightly sloping, its apex blunt. Mesosternum with wide lobes, length of a lobe considerably less than its greatest width. ♂ cerci long, lamellate; apex of each with 2 lobes.

Two species known, distributed in the southern part of western Europe, in the southwestern part of the U. S. S. R., in Asia Minor, and in Syria.

1(1). Pronotum with distinct lateral carinae; posterior margin distinctly notched. Tegmina very short, reaching or slightly extending beyond the first abdominal tergite; apex rounded. Length of ♂ 13.7-16.8, ♀ 20.0-28.2 mm, tegmina ♂ 2.0-3.7, ♀ 4-6 mm. —Moldavian SSR, southeastern part of western Europe, Corfu Island, Asia Minor, Syria (Figure 528). . . . . *1. P. caloptenoides (Br.-W.)

Brunner-Wattenwyl, 1861, Verh. zool.-bot. Gesel. Wien, XI 226 (Platyphyma), Jakobson, 1905:205, 318 (partim), Chopard, 1922:137, 173 (partly), Uvarov, 1925c 91 (partim) Tarbinskii, 1927 69 (partim), Uvarov, 1942, Proc. R. Ent. Soc. Lond, (B), XI, 6 87, 89, Figure 1. —brunneri Stål, 1876, Bih. Sven Vet. Akad Handl., IV, 5:14 (Calliptenus), Brunner-Wattenwyl, 1882 217, 219, Figure 51 (Caloptenus) Obenberger, 1926 99.

56. Genus Calliptamus Serv.

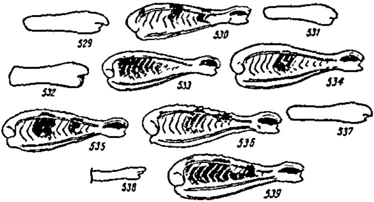
Serville, 1831, Ann. Sci. Natur., XXII 284 (partim), Jakobson, 1905 173, 204, 316 (partim) Uvarov, 1927a:169, 192, Tarbinskii, 1940 22, 150, 156, Tarbinskii, 1948 110, 111. —Caloptenus Burmeister, 1838, Handb. Ent., II 637, Obenberger, 1926 64, 99. —Calliptenus Stål, 1873, Recens Orth., I 72. —Caloptenopsis Kirby, 1914 195, 256 (partim).

Type of genus: Calliptamus italicus (L.).

Eyes irregularly oval; vertical diameter of the eye nearly twice its
254 horizontal diameter and 2-3 times greater than the subocular groove. Pronotum with distinct lateral carinae, always reaching its posterior margin. Tegmina and wings well developed, sometimes abbreviated, but always reaching the middle of the abdomen. Hind femur with finely dentate dorsal carina, they are short and wide, length of femur 2.8-3.8 times greater than its greatest width. Hind tibia dorsally without external apical spine, internal spur of the inner margin slightly greater than the external spur of the same margin. Prosternal process straight, nearly cylindrical; its apex rounded. Mesosternum with wide lobes, length of a lobe considerably less than its greatest width. ♂ cerci long, lamellate, apex of cercus with 2 lobes, of which the ventral lobe has 2 teeth at the apex.

About 15 species are known, distributed in Madeira, in the Canary Islands, in North Africa, in southern Europe and its islands, and in Asia (excluding the northern and southeastern parts).

1(2). Wings colorless at the base. ♂ cerci distinctly widened toward the apex, dorsal apical lobe of cercus considerably longer than the ventral, which has a distinct ventral tooth (Figure 529). Length of ♂ 12.9-21.1, ♀ 25.0-32.5, mm, tegmina ♂ 7.8-12.2, ♀ 13.8-19.5 mm. — Eastern Kazakhstan, southern part of eastern Siberia from the Altai to the Maritime Territory, northern Mongolia, Korea, East China Slightly injures cereal grasses and pastures in eastern Kazakhstan



Figures 529-539
(Figure 532 according to Uvarov, the rest original)

529—Calliptamus abbreviatus Ikonn., ♂, left cercus from the side; 530—C. italicus italicus (L.), ♂, inner aspect of right hind femur, 531—C. turanicus Tarb., ♂, left cercus from the side, 532—C. balucha Uv., ♂, ibid.; 533—C. barbarus cephalotes F.-W., ♂, inner aspect of right hind femur, 534—C. barbarus barbarus (Costa), ♂, ibid., 535—C. barbarus barbarus (Costa), ♂, ibid.; 536—C. barbarus barbarus (Costa), ♂, ibid.; 537—C. tenuicercis Tarb., ♂, left cercus from the side, 538—C. barbarus nanus Mistshenko subsp. n., ♂, left cercus from the side (type), 539—C. barbarus barbarus (Costa), ♂, inner aspect of right hind femur.

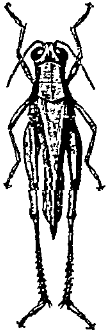


Figure 540. Calliptamus turanicus Tarb., ♂. (Original)

and in eastern Siberia....................*1. C. abbreviatus Ikonn. —Light-winged feelered locust [Prus svetlokrylyi].

Ikonnikov, 1913, Uber die von P. Schmidt aus Korea mitgebrachten Acridiodeen 19. —sibiricus Wnukowsky, 1926, Mitt. Munch. Ent. Gesel., XVI 91. —italicus Uvarov, 1927a 192 (partim). —ictericus Tarbinskii, 1930:180, 185, Figures 5, 10 (partim), Berezhkov, 1937 50, 73 (not Serville) Tarbinskii, 1948 111 (*nec Serville*).

Biology Bei-Bienko, 1932b 32.

255 2(1). Wings orange, rose, or reddish at the base.

3(8). Hind femur with unicolored inner aspect which is yellowish, gray, or rose, and usually *without black bands,* but *sometimes with* 2 incomplete bands appearing to be a prolongation of the blackish bands of the dorsal aspect of the femur and far from reaching the ventro-internal margin (Figure 530). Hind tibia pale orange, rose, or bright red.

4(5). Hind *femur with unicolored inner aspect, which is yellow or gray,* without black spots and bands. Hind tibia with a yellowish dorsal aspect, inner aspect pale orange. ♂ cerci with the dorsal apical lobe equal to its ventral lobe (Figure 531). Length ♂ 23.8-31.5, ♀ 34.5-48.2 mm, tegmina ♂ 17.2-25.0,, ♀ 23.5-39.0 mm. —Southern Kazakhstan, Middle Asia; northeastern Iran, northern Afghanistan. Greatly injures young bogar crops of wheat and barley predominantly, but sometimes also young crops of cotton (Figure 540).......... *2. C. turanicus Tarb. —Bogar feelered locust [Prus bogarnyi].

Tarbinskii, April 1930 180, 184 Figures 4, 9 Tarbinskii, 1948 111 —italicus Jakobson, 1905 204, 316 (partim), Uvarov, 1927a:192 (partim). —turanicus Ramme, Juni 1930, Mitt Zool Mus Berlin, XVI 395 (syn nov).

Biology Bei-Bienko, 1932b 33 Zimin, 1934 82-112 Predtechenskii, Zhdanov and Popova, 1935, 77, 123, 129, 130, 133, 134 Zimin, 1938 39, 78, plate II, Figure 7; Mishchenko, 1949b 167.

5(4). *Hind femur with a rose* or reddish inner aspect, which usually has 2 incomplete blackish bands, which are sometimes very faint (Figure 530). Hind tibias with rose or red dorsal and inner aspects. ♂ cerci with a dorsal apical lobe which is considerably longer than its ventral lobe (Figures 221, 532).

6(7). ♂ cerci with broadly rounded ventral tooth on the ventro-apical lobe (Figure 532). Length of ♂ 16, ♀ 26 mm; tegmina ♂ 8.5, ♀ 16 mm. — Northern India................... 3. C. balucha Uv.†

Uvarov, 1938, Ann. Mag. Nat Hist, (11), 1 376, Figure 2B.

256 7(6). ♂ cerci with a distinct pointed ventral tooth on the ventro-apical lobe (Figure 221) .... *4. C. italicus (L.)—Italian or oasis feelered locust [Prus ital'yanskii ili oazisnyi].

a(b). Tegmina very slightly narrowed apicad, nearly parallel-sided, reaching beyond the distal end of the hind femora. Length of body of ♂ 14.5-23.4, ♀ 24.5-41.1 *mm,* tegmina ♂ 11.3-18.3, ♀ 22.3-31.6 mm.

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† Judging from the description by Kirby (1914 258, 260, Figure 138) his Caloptenopsis punctata is doubtless a representative of the genus Calliptamus Serv, C. balucha Uv. apparently is also a synonym of this species.

Southern half of European part of the U.S.S.R., the Caucasus, southern part of western Siberia, Kazakhstan, Middle Asia; North Africa, western Europe, Asia Minor, Iran, northern Afghanistan, northwestern Mongolia, One of the principal pests of many cultivated and wild plants represented by 2 phases—gregarious and solitary† . . . . *4a. C. italicus italicus (L.)

—italicus Linnaeus, 1758, Syst. Nat., (ed. X), 1:432 (Gryllus Locusta), Jakobson, 1905:204, 316, Figure 6, plate VI, X (in plates Caloptenus, partim); Obenberger, 1926.99 (Caloptenus, (partim); Uvarov, 1927a:192, Figures 208, 218, 252 (partim); Uvarov, 1927b:259, Figure 24C, 69, 88, 89C; Tarbinskii, 1930.180, 183, Figures 3, 8; Tarbinskii, 1940 22, 156, 157, 226, Figures 135^3, 177; Tarbinskii, 1948:111, Figure 139B.—germanicus Fabricius, 1775, Syst. Nat.:291 (Gryllus).—affinis Thunberg, 1815, Mém. Acad. Sci. St.-Pétersb., (5), V:228 (Gryllus).—fasciatum Hahn, 1836, Icone Orth., 1, tab. B, Figure 6 (Acridium).—marginellus Serville, 1839, Hist. Ins. Orth.:694.—cerisanus Serville, 1839, ibid.:695.—marmoratus Fischer-Waldheim, 1846:242, Jakobson, 1905·317.—cerasinus Fischer, 1853, Orth. Eur.:379 (Caloptenus).—discoidalis Walker, 1870, Cat. Derm. Salt. Brit. Mus., IV:686 (Caloptenus).—italicus var. marginellus Jakobson, 1905:317.—italicus var. bilineata Puschnig, 1910, Verh. zool.-bot. Gesel. Wien·26.—italicus ab. pallidus, germanicus, bilineatus et marginellus Obenberger, 1926:100.—italicus var. gilvonigricans Vorontsovskii, 1927, Izvestiya Orenburgskoi stantsii zashchity rastenii, 1:22.—italicus var. blandus Kolossov, 1932, Ent. Nachr., VI, 4:117.

Biology: Dovnar-Zapol'skii, 1924:6, 8, Figure 6; Dovnar-Zapol'skii and Romanova, 1925:1-20, Dovnar-Zapol'skii, 1926.169, Kirichenko, 1926·1-47; Bei-Bienko, 1928,196, Lepeshkin, Zimin and Spasskii, 1931; 1-367, Bei-Bienko, 1932b·31, 227, 387; Lepeshkin, 1934,9-81, 229-243; -Predtechenskii, Zhdanov and Popova, 1935:76, 90, 91; Chetyrkina, 1936,20-22; Zimin, 1938:39, 77, plate X, Figure 56; Mishchenko, 1949b:166; Vasil'ev, 1950a· 2 385-388, Vasil'ev, 1950b.639-642.

b(a). Tegmina very slightly narrowed apicad, usually not reaching the distal end of the hind femora, sometimes only reaching it. Length of ♂ 14.5-23.5, ♀ 25.5-36.1 mm; tegmina ♂ 10.3-16.5, ♀ 14.5-19.4 mm. —Mountains and foothills of Tadzhikistan . .*4b. C. italicus italicus Rme.

Ramme, 1930, Mitt. Zool. Mus. Berlin, XVI·214.
Biology· Mishchenko, 1949b,167.

257 8(3). Hind femur with a large oval black or violet-black spot on the inner aspect, occupying nearly 2/3 of the length of the femur (Figure 533), or with 1-3 black bands; the band running along close to the middle of the femur is always entire, reaching ventro-internal margin (Figure 534-536). Hind tibia either solid yellow, or the dorsal aspect of the tibia is yellowish and the inner aspect orange or orange-red.

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† Key to the Phases:

a(b). Tegmina extending beyond the distal end of the hind femurs in the ♂ for 3 6-4.4, in the ♀ for 4.7-5.6 mm. Length of tegmina ♂ 20.4-22.3, ♀ 27.2-29.4 mm, of hind femur ♂ 12 7-13.5, ♀ 17-18.1 mm . . . . C. italicus italicus (L.) ph. gregaria—Gregarious phase.

Vasil'ev, 1950b 639-642.

b(a). Tegmina extending beyond the distal end of the hind femurs in the ♂ for 1.2-1.9, in the ♀ for 1.8-2.2 mm. Length of tegmina ♂ 17.1-18.2, ♀ 25.4-26.2 mm, of hind femur ♂ 12.1-12 6, ♀ 18 0-18.9 mm . . . . C. italicus italicus (L.) ph. solitaria—Solitary phase.

Vasil'ev, 1950b 639-642.

9(12). Hind femur with a large oval black spot or with black transverse bands on the inner aspect.

10(11). Hind tibia yellow or lemon-yellow. ♂ cerci narrow, nearly parallel-sided; cercus hardly widened at the apex; ventro-apical lobe of the cercus with slightly developed ventral tooth (Figure 537). Length ♂ 15.7-20.3, ♀ 23.8-30.5 mm; tegmina ♂ 9.7-13.8, ♀ 14.8-20.3 mm. —Transcaucasia; Asia Minor, Syria, Palestine, northwestern Iran . . . . *5. C. tenuicercis Tarb. —Transcaucasian feelered locust [Prus zakavkazskii].

Tarbinskii, 1930 180, 183, Figures 2, 7, Tarbinskii, 1940 22, 156, 157, Figure 135[2], Tarbinskii, 1948 111. —iranicus Ramme, 1930, Mitt. Zool. Mus. Berlin, XVI 395 —iranicus aurantiacus Ramme, 1930, ibid .395 (syn. nov.).

11(10). Hind tibia with orange or orange-red inner aspect. ♂ cerci distinctly widened at the apex, the ventro-apical lobe with a distinct [or sharp] strongly developed ventral tooth (Figure 538). . . . . *6. C. barbarus (Costa)—Desert feelered locust [Prus pustynnyi].

a (b). Hind femurs with 1-3 transverse black bands (Figures 534-536) on the inner aspect or they are black for the most part, with 2 light incomplete bands (Figure 539). Length of the ♂ 13.7-16.2, ♀ 23.5-28.3 mm; tegmina ♂ 10.6-13.2, ♀ 16.8-23.4 mm. —Southern part of European part of the U. S. S. R., northern Caucasus, western Kazakhstan, southern part of western Europe, western Pakistan. Sometimes a pest of rubber plants in the Ukraine and of melon fields in Stavropol . . . . *6a. C. barbarus barbarus (Costa).

—barbarum Costa, 1836, Fauna del Regno di Napoli, Ortotteri 13, tab II, Figures 1A-D (Acridium) —siculus Burmeister, 1838, Handb. Ent., II 639 (Caloptenus). —italicus Jakobson, 1905 204, 316 (partim), Obenberger, 1926 99 (Caloptenus) (partim), Uvarov, 1927a:192 (partim), —italicus var. minimus Ivanov, 1888, Trudy Obshchestva ispytatelei prirody pri Kharkovskom universitete, XXI 303, 351, plate III, Figure XI (Caloptenus) —italicus var. siculus Jakobson, 1905 317, Obenberger, 1926 100 (Caloptenus). —siculus minimus Tarbinskii, 1930 180, 182, Tarbinskii, 1948 111.

Biology Bei-Bienko, 1932b 32 Zimin, 1938 39, 78, plate VI, Figure 31, Mishchenko, 1949b 166.

b (a). Hind femur with one solid [or entire] large oval spot on the inner aspect (Figure 533).

c (d). Tegmina shorter, not reaching, reaching, or extending slightly beyond the distal end of the hind femora. Wings brick-red at the base. Length ♂ 13.2-17.1, ♀ 22.8-26.3 mm, tegmina ♂ 7.9-12.2, ♀ 17.1-18.5 mm. —Zeravshan Mt Range, Pendzhikent Region: Zauron village, Zebon village, valley of Arzanpaya, Pendzhikent. (Type from Arzanpaya valley). . . . *6b. C. barbarus nanus Mistshenko subsp. n.

d (c). Tegmina longer, always extending far beyond the distal end of the hind femur. Wings rose at the base. Length of body in the ♂ 17.8-
258 24.2, ♀ 24.0-40.7 mm; tegmina ♂ 15.4-23.1, ♀ 24.3-33.4 mm. —Transcaucasia, southern Kazakhstan, Middle Asia, southern part of Irkutsk Region and Buryat-Mongolia†; North Africa (?), Hither Asia, Iran, northern Afghanistan, West China, northwestern Mongolia. Sometimes a pest of melons, truck gardens, tea and tung plantations in the Transcaucasus, of wheat, melons, truck crops, cotton, and volatile-oil-bearing plants in Tadzhikistan. . . . . *6c. C. barbarus cephalotes F.-W.

† [N... A S S R]

—<u>cephalotes</u> Fischer-Waldheim, 1846 243, Jakobson, 1905:317.—?<u>italicus</u> var. <u>deserticola</u> Vosseler, 1902, Zool. Jahrb., Abt. Syst., XVI·395 (<u>Caloptenus</u>).—<u>siculus</u> Tarbinskii, 1930:180. Tarbinskii, 1940:156, Figure 135[1]; Tarbinskii, 1948:111.—<u>italicus</u> Jakobson, 1905·204, 316 (partim); Uvarov, 1927a:192 (partim).

Biology: Mishchenko, 1949b:166.

12 (9). Hind femora with a large violet-black oval spot on the inner aspect. Length of ♂ 15.5-21.0, ♀ 27.5-31.7 mm; tegmina ♂ 12.1-16.5, ♀ 19.5-22.5 mm. —Eastern Iraq, western Iran (northward to Kazvin) . . . . 7. <u>C. persa</u> Uv.

Uvarov, 1938, Ann. Mag. Nat. Hist., (11), I:377, Figure 2P.

57. Genus <u>Metromerus</u> Uv.

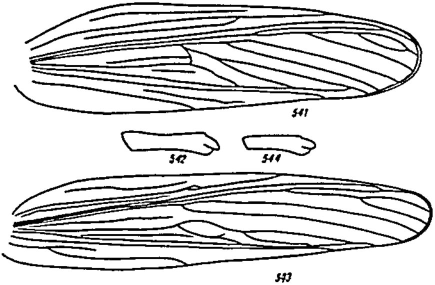
Uvarov, 1938, Ann. Mag. Nat. Hist., (11), I:379, Tarbinskii, 1940·22, 150, 158, Uvarov, 1943a: 70, 83.—<u>Calliptamus</u> Jakobson, 1905:173, 204, 316 (partim).—<u>Kripa</u> Uvarov, 1927a: 169, 193 (partim).

Eyes irregularly oval; vertical diameter of the eyes 1.5-2 times more than the horizontal diameter and 1.5-2.5 times more than the subocular groove. Pronotum with distinct lateral carinae, which are effaced in its posterior part and do not reach its posterior margin. Tegmina and wings well developed. Middle femur with 2 distinct tubercles on the external aspect. Hind femur with a finely toothed dorsal carina, moderately wide; ventro-external field of femur not widened behind the middle; ventro-external part of genicular lobe elongated, rather narrow. Hind tibia dorsally without the external apical spine; inner spur of the inner margin slightly larger than the external spur of the same margin. Prosternal process straight or slightly sloping nearly cylindrical; its apex rounded. Mesosternum with wide lobes; the length of a lobe is considerably less than its greatest width. ♂ cerci long, lamellate; apex of a cercus with 2 lobes, both lobes being without teeth at the apex.

Only 1 species, subdivided into 3 subspecies and distributed in the southeastern regions of the European part of the U. S. S. R., in Kazakhstan, in Transcaucasia, in western and Middle Asia, and in northeastern Africa, is known.

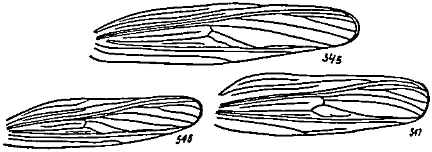
1 (1). Wings rose or violet-rose at the base. Cerci with a small black tooth in the dorso-apical angle, on the inner aspect of the ventral-apical lobe. ♀ ovipositor with a distinct tooth on the ventral margin of the ventral valves at the base . . . . *1. <u>M. coelesyriensis</u> (G.-T.)—False feelered locust [Prus lozhnyi].

a(b). Tegmina in the ♀ usually with a closed median field in the apical part (Figure 541), sometimes it is open, then the tegmina are nearly without dark spots. Hind femur in the ♀ rather slender; length of femur 3.5 times more than its greatest width. ♂ cercus with a long dorso-apical lobe; the length of the lobe, measured from the
259 preapical tooth on the dorsal margin of the cercus to its apex is nearly 2.5 times more than its greatest width (Figure 542). Length ♂ 19.5-23.5, ♀ 26.5-40.2 mm; tegmina ♂ 9.5-17.3, ♀ 16.5-25.3 mm.



Figures 541-544
(Original)

541—*Metromerus coelesyriensis coelesyriensis* (G -T), ♀, right tegmen, 542—*M. coelesyriensis coelesyriensis* (G -T.), ♂, left cercus from the side, 543—*M. coelesyriensis carbonarius* (Uv.), ♀, right tegmen, 544—*M coelesyriensis carbonarius* (Uv.), ♂, left cercus from the side



Figures 545-547. Right tegmen. (Original)

545—*Metromerus coelesyriensis intricatus* Mistshenko subsp. n , ♂, (type), 546—*M. coelesyriensis hissaricus* Mistshenko subsp. n., ♂, (type), 547—*M. coelesyriensis hissaricus* Mistshenko subsp. n., ♀ (allotype).

—Egypt, Palestine, Syria, southeastern part of Asia Minor, Iraq, and Iran (Figure 548). 1a. M. coelesyriensis coelesyriensis (G.-T.)

—coelesyriensis Giglio-Tos, 1893, Bol. Mus. Zool. An. Comp. R. Univ. Torino, VIII, 164:10, Figure 4 (Caloptenus); Jakobson, 1905·205, 317 (Calliptamus) (partim); Uvarov, 1927a:193, Figures 214, 216-217 (Kripa), Tarbinskii, 1940 22, 158 (partim); Uvarov, 1943a·83, Figures 1C, 2C, 3C (partim).

b(a). Tegmina in the ♀ usually with an open median field in the apical part (Figure 543), now and then it is closed and then the tegmina have dense dark spots. Hind femur in the ♀ stouter; length of femur 3 times greater than its greatest width. ♂ cerci with a short dorso-apical lobe; the length of the lobe taken from the preapical tooth on the dorsal margin of the cercus to its apex is twice more than its greatest width (Figure 544).

c(d). Hind femur in both sexes with 2 black or blackish incomplete bands on the inner aspect; sometimes the bands are absent, then the inner aspect of the hind femur is yellow or rose. All the posterior part of the lateral lobe of the pronotum in the ♀ has large punctation and distinct rugae. Length of ♂ 18.5-22.5, ♀ 26.5-34.3mm; tegmina ♂
260 11.7-14.5, ♀ 16.5-21.5 mm. —Azerbaijan, Armenia; Asia Minor, northern Iran. . . . . *1b. M. coelesyriensis angusta (Uv.)

Uvarov, 1934, Eos, X:118, Figure 38d (Kripa); Uvarov, 1943a:84. —coelesyriensis Jakobson, 1905:205, 317 (Calliptamus) (partim); Uvarov, 1927a:193 (Kripa) (partim); Tarbinskii, 1940:22, 158 (partim); Uvarov, 1943a 83 (partim), —italicus ab. carbonaria Uvarov, 1914, Russkoe entomologicheskoe obozrenie, XIV.226 (Calliptamus) (partim).

d(c). Hind femur in both sexes with violet inner aspect which has no dark bands; sometimes in the ♀ it has indistinct dark bands, then the apical third of the posterior part of the lateral lobe of the pronotum has only very small delicate punctation, and the remaining part of the lobe has coarse punctation and distinct rugae.

e(h). Tegmina in the ♂ with distinctly separated radial and medial veins in the apical part of the median field (Figure 545); median field in the ♀ narrow, its greatest width equal to or 1.25-1.5 times more than the greatest width of the cubital field (Figure 543).

f(g). All the posterior part of the lateral lobe of the pronotum in both sexes with coarse punctation and distinct rugae. Tegmina in the ♀ far from reaching the distal end of the hind femora. Length of ♂ 15.7-23.3, ♀ 23.3-41.2 mm; tegmina ♂ 9.3-18.3, ♀ 15.8-25.3 mm. —South Turkmenia: Archman, Germab, Ashkhabad, Chuli Gorge, Mt. Shakhshakh, Chaek, Firyuza; Iran: Shaku, Teheran, Shahrud, Gilyan, Khorasan (Durukh-Nekhbendan, Rekut-bagyran of west Birdzhanda); locality of Kuasa in Iranian Baluchistan. (Type from Chuli Gorge in Kopet Dag) . . . . *1c. M. coelesyriensis intricatus Mistshenko subsp. n.

—coelesyriensis Jakobson, 1905:205, 317 (Calliptamus) (partim); Uvarov, 1927a·193 (Kripa) (partim); Tarbinskii, 1940 22, 158, 226 (partim); Uvarov, 1943a 83 (partim).

261 g(f). Only the lower 2/3 of the posterior part of the lateral lobe of the pronotum in both sexes with coarse punctation and distinct rugae,

but the upper 1/3 has very "delicate" small obliterated punctation Tegmina in the ♀ reaching or extending beyond the distal end of the hind femur. Length of ♂ 15.3-19.8, ♀ 23.5-31.5 mm, tegmina ♂ 10.5-16.5, ♀ 13.5-22.3 mm. —Chkalov† Region Verkhnyaya Dneprovka near Chkalov; Kazakhstan· Lake Inder, Kalmykov, Tasty-terekty River, Temir River, Koilibai, Bakr-tau, east of Mugodzhary, Barsa-Kelmes, Karaganda Region, Zaisan, Saikan Range in the valley of the Sary-bulak, valley of the Dzhamin west of Zaisan, Uzbekistan Kokand, Tadzhikistan Pendzhikent, Vakhan, south of Khorog, northern Afghanistan Ak-tepe. Sometimes a slight pest of different young crops in Kazakhstan . . *1d. M. coelesyriensis carbonarius (Uv.)

—italicus ab. carbonaria Uvarov, 1914, Russkoe entomologicheskoe obozrenie, XIV 226 (Calliptamus) (partim).—coelesyriensis Uvarov, 1927a 193 (Kripa) (partim), Tarbinskii, 1940·22, 158, 226 (partim) Uvarov, 1943a:83 (partim)

Biology: Zimin 1938 41, 79, Figures 48, 51 Mishchenko 1949b 168 (M coelesyriensis violaceipes Mistsh.)

h(e). Tegmina in the ♂ with the radial and medial veins fused (Figure 546) in the apical part of the median field, median field in the ♀ wide, its greatest width nearly twice more than the greatest width of the cubital field (Figure 547). Length of body of the ♂ 16.2-17.3, ♀ 23.2 mm; tegmina ♂ 9.2-9.7, ♀ 12.5 mm. —Hissar Range, environs of Lake Iskander-kul (River Khazor-mech). . . . . *1e. M. coelesyriensis hissaricus Mistshenko subsp. n.

58. Genus Sphodromerus Stål

Stål, 1873, Recens Orth., I 72 Jakobson 1905 173, 204, 315 Uvarov, 1927a 169, 194 Uvarov, 1943a 70 —Kripa Kirby, 1914:195, 257, Uvarov, 1927a 169, 193 (partim).

Type of genus: Sphodromerus serapis (Serv), Egypt.

Eyes irregularly oval, vertical diameter of the eye 1.5-2 times more than its horizontal diameter and 1.5-3 more than the subocular groove Pronotum with lateral carinae either almost entirely obliterated, or even slightly developed only in the anterior part. Tegmina and wings well developed, sometimes only slightly abbreviated. Middle femur externally with one dorsal groove [sic!]. Hind femur with a fine-toothed dorsal carina, very wide, ventro-external field of femur distinctly widened behind the middle, external ventral part of genicular lobe short and wide. Hind tibia dorsally without external apical spine, inner spur of inner margin slightly larger than its outer spur. Prosternal process nearly straight, conical, its apex pointed. Mesosternum with wide lobes, the length of a lobe is considerably less than its greatest width ♂ cerci long, plate-like, apex of a cercus with 2 lobes, both lobes being adentate at the apex.

There are 17 species known, distributed in North and northeastern
262 Africa and in western Asia

1 (2). Wings in both sexes long and narrow, colorless near the base, or they are basally light blue, or lilac, transparent in the apical part, wing nearly twice as long as its greatest width Tegmina in both

† [Now Orenburg]

sexes with dark spots, making oblique bands. . . . . *1. S. luteipes Uv.

a(b). Hind femur with a yellow or orange ventral aspect. Hind tibia orange. Length of ♂ 20.5-23.8, ♀ 25.4-37.0 mm; tegmina ♂ 17.0-20.6, ♀ 25-29 mm. —Eastern Iraq, western and northwestern Iran . . . . 1a. S. luteipes luteipes Uv.

Uvarov, 1943a:73, 74, 82.—luteipes Uvarov, 1933, Trudy Zoologicheskogo instituta AN SSSR, (1932), 1 228.

b(a). Hind femur with a red ventral aspect. Hind tibia red. Length of ♂ 23, ♀ 37.5-40.2 mm; tegmina ♂ 19, ♀ 28-32 mm. —Between Goudan (southern Turkmenia) and Quchan (northeastern Iran); eastern Iran, western India (Figure 549). . . *1b. S. luteipes rubripes Uv.

Uvarov, 1943a:73, 74, 82, tab. I, Figure 5.—serapis Uvarov, 1927a:194, Figure 215 (partim).

2 (1). Wings of ♂ shorter and wider; rosy at the base, darkened in the apical part; the wing nearly 1.5 times longer than its greatest width. ♂ tegmina almost uniformly darkened. ♀ unknown. Length ♂ 24, tegmina 16 mm. —Afghanistan: Kabul-Dzhalalabad. . . . . 2. S. undulatus afghanus B.-Bienko.

Bei-Bienko, 1949, Doklady AN SSSR, (novaya seriya), LXVII, 1:175.

59. Genus Acorypha Kr.

Krauss, 1877, Sitz. Akad. Wissen. Wien, Math.-nat. Kl., Abt. I, LXXVI.38, Uvarov, 1926, Trans. Ent. Soc. Lond., 1925 452.—Caloptenopsis I. Bolivar, 1889, Journ. Sci. Math., Phys. Nat. Lisboa, (2), I-173 (partim), Kirby, 1914:195, 256 (partim).

Type of genus: Acorypha picta Kr., Senegal.

Eyes irregularly oval; vertical diameter of the eye 1.5-2 times more
263 than its horizontal diameter and 1.75-3 times more than the subocular groove. Pronotum with distinct lateral carinae which are sometimes obliterated in the posterior part. Tegmina and wings well developed. Hind femur with a finely-dentate dorsal carina, stout. Hind tibia dorsally without external apical spine; inner spur of inner margin 1.5-2 times larger than its outer spur. Prosternal process cylindrical, conical, sometimes laterally compressed, straight, or slightly curved; its apex pointed or rounded. Mesosternum with wide lobes, the length of a lobe is considerably less than its greatest width. ♂ cerci long, plate-like; the apex of a cercus with 2 lobes, moreover both lobes are apically adentate.

A large number of species, distributed in Africa and India, are known.

1 (1). Wings pinkish at the base. Hind femur with a yellowish inner aspect which sometimes has a dark band. Hind tibia with a second inner spur which bears a distinct tuft of hairs on the apex. Prosternal process slightly widened toward the rounded apex, laterally

distinctly compressed. Length of ♂ 20, ♀ 26-35 mm; tegmina ♂ 14.5, ♀ 19 mm. —India· Kashmir, Baltistan, Madras. (According to Walker and Martinez (Martinez y Fernandez-Castillo)) . . . . 1. A. glaucopsis (Walk.)

Walker, 1870, Cat Derm. Salt. Brit. Mus., IV 702 (Caloptenus) —?ilturifer Walker, 1870, ibid.;703 (Caloptenus). Kirby, 1914;258, 259 (Caloptenopsis). —crassiusculus Martinez y Fernandez-Castillo, 1898, Act Soc Esp. Hist. Nat, (2), V 11 (Caloptenopsis) —glaucopis Kirby, 1914 258, 259 (Caloptenopsis).

60. Genus Thisoicetrinus Uv.

Uvarov, 1921, Trans. Ent. Soc. Lond. 128 —Thisoecetrus Jakobson, 1905:174, 205, 318 (partim). Tarbinskii, 1948 110, 111 (partim). —Thisoecetrinus Uvarov, 1925c 87, 92 Uvarov, 1927a 169, 194 —Thisoecetrus subgen. Thisoecetrinus Tarbinskii, 1940 21, 155

Eyes irregularly oval, vertical diameter of the eye 2-2.5 times more than its horizontal diameter and 2.5-3 times more than the subocular groove. Antennae long, in the ♂ nearly twice, and in the ♀ 1.25 times more than the length of head and prothorax combined. Pronotum with hardly perceptible lateral carinas. Tegmina and wings well developed. Hind femur with finely dentate dorsal carina, slender, narrow, length of femur 5-5.5 times greater than its greatest width. Hind tibia dorsally without external apical spine and with 14-16 spines on the outer margin. Prosternal process cylindrical, slightly sloping, its apex rounded. Mesosternum with wide lobes, the length of a lobe considerably less than its greatest width. ♂ cerci wide, platelike, arcuately curved downward, apically entire, the apex of a cercus is rounded. ♂ subgenital plate long, slightly pointed.

Only 1 species, distributed in the southeastern regions of the European part of the U. S. S. R., in the Caucasus, and in Hither and Middle Asia, is known.

1(1). Tegmina rather wide, length of a tegmen 4.8-5.4 times more than
264 the greatest width. Wings greenish at the base. Hind tibia red. Length of ♂ 20.0-22.3, ♀ 35.0-55.4 mm, tegmina ♂ 16.5-24.2, ♀ 23.6-37.5 mm. —Lower Volga Region, the Caucasus, Middle Asia, Asia Minor, Palestine, Iraq, Iran, northern Afghanistan. Slightly injures melons, truck- and technical crops, and also hay lands. (Figure 550). . . . . *1. Th. pterostichus (F. -W.) —Melon 'young mare' grasshopper [Kobylka bakhchevaya].

Jakobson, 1905 205, 319, Figure 38 (Thisoecetrus) Uvarov, 1925c 93, Figure 107 108 (Thisoecetrinus). Uvarov, 1927a 194, Figures 253-254 (Thisoecetrinus) Tarbinskii, 1927 70 (Thisoecetrinus). —pterosticha Fischer Waldheim, 1833, Bull. Soc. Imp Nat. Mosc, VI 384 (Oedipoda) —dorsatum Fischer-Waldheim, 1839, ibid XII, 7 301 (Acridium) —fischeri Fieber, 1853, Lotos, III:98 (Eyprepocnemis). —dorsatus Jakobson, 1905 205, 319 (Thisoecetrus) Uvarov, 1921, Trans Ent Soc Lond. 129, Tarbinskii, 1940 21, 155, 226, Figure 132A, 178 (Thisoecetrus subgen Thisoecetrinus), Tarbinskii, 1948 111 (Thisoecetrus).

Biology Bei-Bienko, 1932b 33, Predtechenskii, Zhdanov and Popova, 1935:136, Zimin 1938 39, 80, plate I, Figure 1, plate X, Figure 62, Mishchenko, 1949b 168

61. Genus Thisoicetrus Br.-W.

Brunner-Wattenwyl, 1893, Ann. Mus. Civ. Stor. Nat. Genova, (2), XIII (XXXIII):150 (partim); Uvarov, 1921, Trans. Ent. Soc. Lond.:122.—Euprepocnemis Brunner-Wattenwyl, 1882-86, 226 (partim);—Thisoecetrus Jakobson, 1905 174, 205, 318 (partim), Uvarov, 1927a:169, 194, Tarbinskii, 1940:21, 150, 154 (partim), Tarbinskii, 1948:110, 111 (partim).

Type of genus: Thisoicetrus littoralis (Ramb.).

Eyes irregularly oval; vertical diameter of eye nearly twice more than its horizontal diameter and 2-3.5 times more than the subocular groove. Antennae short, in the ♂ nearly 1.5 times longer than the head and pronotum combined, and in the ♀ only reaching the posterior margin of the pronotum. Pronotum with distinct lateral carinae, which sometimes are obliterated in the posterior part. Tegmina and wings well developed. Hind femur with finely dentate dorsal carina, slender; length of a femur 3.8-6.2 times more than its greatest width. Hind tibia dorsally without the external apical spine, and with 10-16 spines on the outer margin. Prosternal process nearly cylindrical, slightly sloping; its apex rounded. Mesosternum with wide lobes; length of a lobe considerably less than its greatest width. ♂ cerci plate-like, wide, arcuately curved down, apically entire; apex of a cercus rounded. Subgenital plate of the ♂ short, rounded, sometimes with 2 tubercles on the apex.

About 28 species, distributed in Africa, in the southern part of the Iberian Peninsula, on some Mediterranean islands, in Hither, Middle, and southern Asia, in the Caucasus, and in the southeastern part of the European part of the U.S.S.R., are known.

265 1 (8). Hind femur very slender; the length of a femur is 5-6 times more than its greatest width.

2 (5). ♀ metathorax with a rather wide space between the lobes; its width at its anterior margin slightly less than its length (Figure 551). Subgenital plate in the ♂ with 2 tubercles on the apex (Figures 552, 553).

3 (4). Hind femur in both sexes very slender; length of a femur 6 times more than its greatest width. Subgenital plate in the ♂ with large widely spaced tubercles on the apex (Figure 552). Length of ♂ 15.5-23.5, ♀ 23.4-35.6 mm; tegmina ♂ 12.3-21.4, ♀ 17.5-33.3 mm. —The Caucasus, western and southern Kazakhstan, Middle Asia; Spain, Cyprus, North Africa, Arabia, Palestine, Syria, Iraq, Iran, northern Afghanistan, western Pakistan. Slightly injures cotton and tobacco in Azerbaijan. (Figure 560) . . . . *1. Th. adspersus (Redt.)—Spotted 'young mare' grasshopper [Kobylka krapchataya].

Jakobson, 1905:205, 319 (Thisoecetrus) Uvarov, 1921, Trans. Ent. Soc. Lond.:123. Uvarov, 1927a:195, Figures 217-218 (Thisoecetrus). Tarbinskii, 1927:70 (Thisoecetrus). Uvarov, 1939.377, 378 Tarbinskii, 1940:21, 153, Figure 132C (Thisoecetrus) Tarbinskii, 1948:111 (Thisoecetrus).—adspersus Redtenbacher, 1889, Wien. Ent. Zeitg., VIII 32 (Euprepocnemis)

Biology: Bei-Bienko 1932b:33 Predtechenskii, Zhdanov and Popova, 1935:136, Mishchenko, 1949b 164.

4 (3). Hind femur in the ♂ less slender; length of the femur 5 times more than its greatest width. Subgenital plate of the ♂ apically with small, very narrowly spaced, tubercles (Figure 553). ♀ unknown. Length

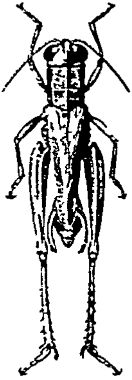


Figure 548 Metromerus coelesyriensis coelesyriensis (G -T.), ♂ (Original)

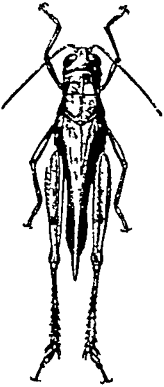


Figure 549. Sphodromerus luteipes rubripes Uv , ♀. (Original)

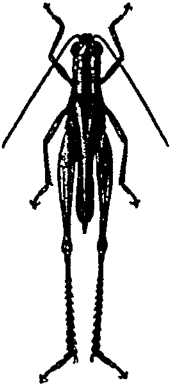
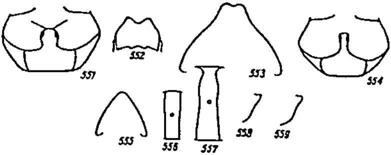


Figure 550 Thisoicetrinus pterostichus (F. W), ♂. (Original)



Figures 551-559
(Original)

551—Thisoicetrus adspersus (Redt), ♀, metathorax from below 552—Th adspersus (Redt.), ♂, apex of subgenital plate from below, 553—Th bituberculatus B.-Bienko, ♂, ibid , 554—Th theodori delicatus Mistshenko subsp n., ♀, metathorax from below (paratype) 555—Th. theodori delicatus Mistshenko subsp. n., ♂, apex of subgenital plate from below (type), 556—Th theodori delicatus Mistshenko subsp n , ♂, frontal ridge, front view (type), 557—Th littoralis similis (Br -W), ♂, ibid., 558—Th littoralis littoralis (Ramb.), ♂, subgenital plate from the side, 559—Th littoralis similis (Br -W.), ♂, ibid

66 of ♂ 21.4, of tegmina 17.6 mm. —Northern Iran; Veramin. . . . . 2. Th. bituberculatus B.-Bienko.

Bey-Bienko, 1948, Proc. R. Ent. Soc. Lond., (B), XVII,72, Figure 7.

5 (2). Metasternum in the ♀ with a narrow space between the lobes; its width at the anterior margin 1/2-2/3 its length (Figure 554). Subgenital plate in the ♂ apically without tubercles (Figure 555).

6 (7). Frontal ridge in both sexes not narrowed at the fastigium; its width between the antennae nearly equal to its width at the fastigium and in the ♂ 1.75 times more than the width of the vertex between the eyes (Figure 556). Pronotum in the ♀ with obliterated lateral carinae. Length of ♂ 15.2-16.1, ♀ 24.5-28.5 mm; tegmina ♂ 11.7-12.6, ♀ 18.5-20.5 mm. —Turkmenia, Kopet Dag: Chuli Gorge, Miemly; northern Iran; Kazvin. (Type from Kazvin) . . . . *3. Th. theodori delicatus Mistsh. subsp. n.

7 (6). Frontal ridge in both sexes distinctly narrowed at the fastigium; its width between the antennae 1.5-1.75 times more than its width at the fastigium and in the ♂ hardly more than the width of the vertex between the eyes (Figure 557). Pronotum in the ♀ with distinct lateral carinae . . . . *4. Th. littoralis (Ramb.)

a (b). Hind tibia with red-violet apical part. Subgenital plate in the ♂ with weakly produced apex (Figure 558). Length of ♂ 18.6-22.7, ♀ 29.5-34.3 mm; tegmina ♂ 16.5-21.5, ♀ 25.5-31.7 mm. —Azerbaijan, southern Kazakhstan, northern Kara-Kalpakia; Iberian Peninsula . . . . *4a. Th. littoralis littoralis (Ramb.)

Uvarov, 1939:378, 381, Figure 297L. —littoralis Rambur, 1839, Faune entomologique de l'Andalousie, II:78, tab. VII, Figures 1-2 (Gryllus), Brunner-Wattenwyl, 1882:220, 221, Figure 52 (Euprepocnemis) (partim); Uvarov, 1921, Trans. Ent. Soc. Lond.:122 (partim), Uvarov, 1927a:195, Figures 255-256 (Thisoecetrus) (partim). Tarbinskii, 1940 36 (Thisoecetrus) (partim). —litoralis Jakobson, 1905: 205, 319 (Thisoecetrus) (partim).

b (a). Hind tibia with light red apical part. Subgenital plate of the ♂ with distinctly produced apex (Figure 559). Length of ♂ 20.6-29.5, ♀ 26.4-50.6 mm; tegmina ♂ 19.5-24.5, ♀ 31.0-37.5 mm. —Southern part of Middle Asia; Egypt, Arabia, Palestine, Cyprus, Syria, Iraq, Iran, northern Afghanistan, western Pakistan. In Egypt it injures different cultivated plants . . . . *4b. Th. littoralis similis (Br.-W.)

Uvarov, 1939,378, 381, Figure 297S. —similis Brunner-Wattenwyl, 1861, Verh. zool.-bot. Gesel. Wien, XI:224 (Caloptenus); Jakobson, 1905:319 (Caloptenus). —notata Walker, 1870, Cat. Derm. Salt. Brit. Mus., III:574 (Cyrtacanthacris). —litoralis Jakobson, 1905:205, 319 (Thisoecetrus) (partim). —littoralis Uvarov, 1921, Trans. Ent. Soc. Lond.:122 (partim); Uvarov, 1927a:195 (Thisoecetrus) (partim); Tarbinskii, 1940:36 (Thisoecetrus) (partim). —littoralis asiaticus Uvarov, 1933, Trudy Zoologicheskogo Instituta AN SSSR, (1932), I 230 (Thisoecetrus).

Biology: Bei-Bienko, 1932b:33, Mishchenko, 1949b:168.

264 8 (1). Hind femur stout and short; length of a femur 3.8-4.1 times more than its greatest width. Pronotum short; lateral carinae obliterated in the posterior part. Subgenital plate in the ♂ very short, bluntly conical, its apex not produced. Length of ♂ 21.8-22.2, ♀ 28.0-34.5 mm;

tegmına ♂ 16.0-18.5, ♀ 18.5-24.5 mm. —Eastern Iran, ın the north to Khorasan, Afghanıstan, northwestern Pakıstan. 5. Th. persa Uv.

Uvarov, 1939 378, 380. —charpentieri persa Uvarov, 1933, Trudy Zoologicheskogo instituta AN SSSR (1932), 1 231 (Thisoecetrus)

62. Genus Euprepocnemıs Fıeb.

Stal, 1873, Recens Orth., 1 75 (partim), Brunner-Wattenwyl, 1882 86, 220 (partim), Jakobson 1905 174, 205, 320 Shiraki, 1910 52, 79 Kirby, 1914 195, 267, Uvarov, 1921, Trans Ent Soc. Lond 110, Uvarov, 1927a 169, 196, Tinkham, 1940 347, 350 Tarbinskii, 1940 21, 150, 154 Tarbınskii, 1948 110, 111. —Euprepocnemis Fieber, 1853, Lotos, III 98 (partim).
Type of genus Euprepocnemis plorans (Charp.).

Eyes ırregularly oval, vertıcal dıameter of the eye 1.75 tımes more than its horızontal dıameter and nearly 2-4 tımes more than the subocular groove. Pronotum wıth dıstınct lateral carınae, whıch are oblıterated posterıorly, ın the posterıor part. Tegmına and wıngs well developed. Hınd femur wıth fınely dentate dorsal carına, slender, length of the femur 4-5.1 tımes greater than ıts greatest wıdth. Hınd tıbıa dorsally wıthout extern al apıcal spıne and wıth 9-11 spınes on the outer margın. Prosternal process nearly cylındrıcal, slıghtly wıdened toward the rounded apex, slıghtly slopıng. Mesosternum wıth wıde lobes, length of a lobe consıderably less than ıts greatest wıdth. ♂ cercı narrow, very slıghtly bent downward, laterally compressed, poınted, or medıanly compressed, wıdened toward base and apex.

About 25 specıes, dıstrıbuted chıefly ın the tropıcs and subtropıcs of the Old World, are known.

1 (8). Vertex ın the ♀ wıth a dıstınct medıan carına (Fıgure 562). ♂ cercı conıcal, poınted (Fıgure 234).

2 (5). Hınd tıbıa bıcolored, ın the basal half blue, sky-blue, or black, ın the apıcal half, red or red-vıolet.

3 (4). Tegmına long, reachıng or extendıng beyond the dıstal end of the hınd femora, costal fıeld wıth a gray-yellow or straw-color band. Hınd tıbıa blue or sky-blue ın the basal half and wıth 2 lıght entıre or ıncomplete rıngs, ın the apıcal half red or vıolet-red. Length of ♂ 23.0-31.5, ♀ 30.5-44.5 mm, tegmına ♂ 18.5-27.0, ♀ 22.5-34.5 mm —Nearly all the Caucasus, Turkmenıa, southern part of western Europe, North Afrıca, Hıther Asıa, Iraq, Iran. Slıghtly ınjures cotton, alfal-
268 fa, sugar cane, and okra. (Fıgure 561) . . . . . .*1. Eu. plorans (Charp.) —Swımmıng 'young mare' grasshopper [Kobylka plovuchaya].

Charpentier, 1825, Hor ent. 134 (Gryllus) Jakobson, 1905 205, 320 (partly) Uvarov, 1927a 196, Fıgure 259, 260, Tarbınskıı, 1940.21, 154, Fıgure 131, Tarbinskıı, 1948 111, Figure 140a. —reticulatum Fischer-Waldheim, 1839, Bull Soc Imp. Nat. Mosc. 301 (Acridium?) —tarsius Fischer Waldheim 1846 241 (Calliptamus) Jakobson 1905 318 (Calliptamus) —ornatipes Walker, 1870, Cat. Derm. Salt. Brit Mus, III 575 (Cyrtacanthacris) —consobrina Walker, 1870, ibıd., IV 673, 674 (Heteracris) —reticulatus Jakobson, 1905 320 (Calliptamus) —plorans plorans Uvarov, 1921, Trans Ent Soc Lond 110, 119.

Biology Bei-Bienko, 1932b 33, Mishchenko, 1949b 168

Figure 560. Thisoicetrus adspersus (Redt.), ♂. (Original)

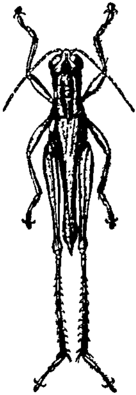


Figure 561. Euprepocnemis plorans (Charp.), ♂. (Original)

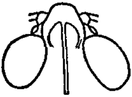


Figure 562. Euprepocnemis plorans (Charp.), ♀, vertex from above. (Original)

4 (3). Tegmina shorter, not reaching the apex of the hind femora, costal field without a light band. Hind tibia in the basal half black and wit one yellow ring, red in the apical half. Length of ♂ 28-32, ♀ 43-47 mm; tegmina ♂ 19-25, ♀ 27.0-32.1 mm. —China· Hupeh, Kiangsu, Kwangsi, Kiangsi, Fukien, Kwangtung, Taiwan (According to Shiraki and Willemse) . . . . 2. Eu. hokutensis Shir.

Shiraki, 1910 79, 81, tab II, Figures 2a-c, Uvarov, 1935, Lingn Sci Journ., XIV, 2 268 Tinkham 1940·350. —chinensis Willemse, 1932, Natuurh. Maandblad, XXI, 8 105, Figure 3.

5 (2). Hind tibia dorsally unicolored—light red, orange, grayish, grayish orange, or bluish

269 6 (7). Tegmina with dark spots. Hind tibia dorsally grayish, grayish-oliv or bluish. 3. Eu. alacris (Serv.)

a (b). Pronotum with distinct light lateral bands. Hind tibia dorsally bluisl Length of ♂ 28.3-29.6, ♀ 38.4-41.3 mm, tegmina ♂ 22.7-25.3, ♀ 29.2 32.4 mm. —Southern and southeastern Iran, Afghanistan, Pakistan, India, Ceylon . . . . 3a. Eu. alacris alacris (Serv.)

—alacre Serville, 1839, Hist. Nat. Ins. Orth.: 682 (Acridium). —deponens Walker, 1859, Ann Mag Nat. Hist., (3), IV 222 (Acrydium). —rudis Walker, 1870, Cat Derm Salt Brit. Mus., IV 662, 664 (Heteracris)

b (a). Pronotum with blunt, though sometimes distinct, lateral light bands. Hind tibia dorsally grayish or grayish-olive. Length of ♂ 22.2-27.1 ♀ 33.4-36.2 mm, tegmina ♂ 18.5-25.5, ♀ 26.5-31.4 mm. —Iraq, south western Iran. . . . . 3b. Eu alacris impictus Uv.

Uvarov, 1933, Trudy Zoologicheskogo Instituta AN SSSR, (1932), I 232

7 (6). Tegmina without dark spots. Hind tibia dorsally light red or orange Hind femur slender, length of femur 4.7-5.1 times more than its greatest width Length of ♂ 24.3-30.0, ♀ 34.5-44.3 mm, tegmina ♂ 21-27, ♀ 29.0-37.5 mm. —Middle Asia. . *4. Eu. unicolor Tarb.

Tarbinskii, 1928, Izvestiya Instituta zoologii i fitopatologii, 4 60.

8 (1). Vertex in the ♀ without median carina. ♂ cerci medially compressed, widened toward base and apex, apex of a cercus rounded (Figure 235) Tegmina with indistinct darkish spots. Hind femur stout, length of femur 4.5 times greater than its greatest width. Hind tibia straw-colored in the basal third, with 2 darkish rings—one at the base, the other before the middle; apical part red. Length of ♂ 17.5-25.5, ♀ 32.5-37.5 mm, tegmina ♂ 19.5-23.5, ♀ 28.0-31.5 mm. —South part of Maritime Territory, Kashmir, Baltistan, northwestern and eastern China, Korea, Japan. . . . . *5. Eu. shirakii I Bol.

I Bolivar, 1914, Trab. Mus Nac. Cien. Nat. Madrid, Ser. Zool , 20 11, Uvarov, 1921, Trans Ent Soc Lond.: 117, Tinkham, 1940: 350, 351 —plorans Jakobson, 1905 205, 320 (partly), Shiraki, 1910 79 (nec Charpentier).

63. Genus Habrocnemis Uv.

Uvarov, 1930, Ann. Mag. Nat. Hist.; (10), V:253.
Type of genus: Habrocnemis sinensis Uv.

Eyes irregularly oval; vertical diameter of the eye 1.75 times its horizontal diameter and nearly twice the subocular groove. Pronotum with distinct, but also somewhat obliterated lateral carinae. Tegmina greatly shortened, lateral, hardly extending beyond the posterior margin of the metanotum or of the first abdominal tergite. Wings hardly perceptible. *Hind femur* with finely dentate dorsal carina, they are short and stout; length of a femur 3.2 times more than its greatest width. Hind tibia dorsally without external apical spine and with 6-7 spines on the
270 outer margin. Prosternal process pyramidal or flatly cylindrical; apex pointed or rounded. Mesosternum with wide lobes; length of a lobe considerably less than its greatest width. ♂ cerci laterally compressed; apical part strongly compressed and slightly curved; apex pointed.

Only 2 species living in Burma and southeastern China, are known.

1(1). Frontal ridge slightly depressed, gradually and slightly widened toward the clypeus. Vertex depressed. Pronotum with a long anterior part; length of the anterior part 1.5 times more than that of the posterior part of the pronotum. Prosternal process flatly cylindrical, with a blunt rounded apex. Mesosternum with a wide space between the lobes; its narrowest part hardly less than the narrowest part of the mesosternal lobe. Length of ♂ 21, ♀ 31.5-33.4 mm; tegmina ♂ 5, ♀ 5.6-6.5mm. —China: Szechwan. (♂ according to Uvarov) . . . . 1. H. sinensis Uv.

Uvarov, 1930, Ann. Mag. Nat. Hist., (10), V:254, Chang, 1937, Notes. Ent. Chinoise, IV, 8:194.

2. Subfamily PYRGOMORPHINAE

(Compiled by Bei-Bienko)

Antennae 8-19 segmented, often shorter than the head and pronotum combined, filiform, ensiform, or triangular, rarely serrate. Head often conical, with sloping frons (Figures 564, 565, 568-570), making an acute angle with the vertex; vertex horizontal, its apex projecting forward between the eyes (only in genus Tenuitarsus Bol., is the head shaped as in subfamily Oedipodinae; Figure 571); frontal ridge between the antennae narrow, usually with a fine groove, often extending onto the fastigium; foveolae completely dorsal, situated near the anterior margin of the vertex, flat, contiguous, or separated by a fine longitudinal groove (Figures 564, 571). *Prosternum* between the front legs moderately raised in the anterior part, sometimes with a conical tubercle or narrow plate-like process, or the whole anterior margin strongly raised up in the form of a collar covering the mouth from below. Space between the lateral lobes of the mesosternum

usually large, often narrowed caudad. Tegmina, if developed, usually narrow with straight almost unbranched longitudinal veins (only in the Systellae-group from southeastern Asia are they wide, leaf-like, apically truncate). Hind femur externally between the carinas without regular areas arranged like feathers, sometimes with oblique convex lines above the ventral carina. Second abdominal segment laterally without rough plates. Epiphallus in the form of 2 lateral plates, joined by a narrow bridge.

A predominantly tropical subfamily, it is represented in southern parts of Europe and temperate Asia only by a small number of genera and species. Six genera are studied below, 2 of which are found in the U. S. S. R. and the other 4 in adjacent countries, but the possibility that some may be found in the U. S. S. R. cannot be excluded

Peculiar only to southern and eastern Tibet and the province of Yunnan in China, the genus Mekongia Uv., is known from 3 completely or nearly apterous species, which are not studied below, likewise the purely
271 tropical genus Phymateus Thunb. is not studied, being represented by a number of species in Africa but known also from only one species from the province of Szechwan in China

The majority of the species studied below live on associations of herbaceous plants and belong to the chortobionts, peculiar members of the genera Chrotogonus Serv. and Tenuitarsus Bol are typical geophiles and live on sandy substrates

Key to Genera of the Subfamily Pyrgomorphinae

1 (8). Anterior margin of prothorax not raised in the form of a collar. Head strongly produced forward, completely cone-like (Figures 563, 565), but if the head is short then the tegmina have many round yellow spots.

2 (7). Head strongly produced forward, long, cone-like (Figures 563, 565). Pronotum without large distinctly projecting tubercles and rugae. Tegmina without round yellow spots.

3 (6). Antennae articulated near the eyes directly under the lateral ocelli (Figure 563) Prosternum moderately thickened in the anterior part, sometimes with a slight conical tubercle, but not raised in the form of a plate. Postero-ventral angle of the lateral lobes of the pronotum truncate or straight, the ventral margin usually sinuous.

4 (5) Tegmina completely developed or moderately shortened, they reach the middle of the abdomen or are still longer, sometimes being contiguous on the medio-dorsal line, wings not shorter or hardly shorter than the tegmina. . . . . 64. Pyrgomorpha Serv.

5 (4). Body perfectly apterous or the tegmina are strongly abbreviated, not extending beyond the third abdominal segment, not contiguous on the medio-dorsal line, wings absent or considerably shorter than the tegmina .65. Pyrgomorphella I. Bol.

6 (3). Antennas shifted forward from the eye and articulated before the lateral ocelli (Figure 565). Prosternum anteriorly with a process in the form of a narrow plate. Postero-ventral angle of lateral lobes of pronotum usually acute, ventral margin straight, often granular (Figure 565). Head with a longitudinal row of small tubercles behind the eyes (Figure 565). . . . . 66. Atractomorpha Sauss.

7 (2). Head short. Pronotum with distinctly projecting large tubercles and rugae, with a raised process near the anterior margin. Tegmina with many round yellow spots. . . . . .67. Aularches Stål.

8 (1). All the anterior margin of the prothorax strongly raised in the form of a collar covering the mouth from below. Head short. Body, especially in the ♀, at least a little, flattened.

9 (10). Body strongly roughened, very wide in the ♀ (Figure 573). Spurs of hind tibiae shorter, the inner pair not longer than the first segment of the posterior tarsus. Fastigium horizontal, projecting forward between the eyes. Frontal ridge between the antennae strongly compressed, projecting in the form of a plate . . . . 68. Chrotogonus Serv.

10 (9). Body nearly smooth, slender. Spurs of hind tibiae unusually long and slender, longer than the first segment of the tarsus (Figure 572). Fastigium sloping, not projecting forward between the eyes (Figure 571), extending roundly into the frons. Frontal ridge between the antennae not plate-like and not projecting forward. . . . . 69. Tenuitarsus I. Bol.

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64. Genus Pyrgomorpha Serv.

Serville, 1839, Hist. Nat. Ins. Orthopt.:583; Jakobson, 1905:290, Bolivar, 1904, Bol. Soc. Esp. Hist. Nat., IV:451; Tarbinskii, 1940:216.

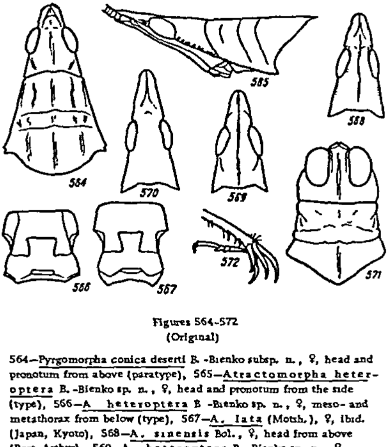
Type of genus: P. conica (Ol.).

Antennae 13-17 segmented, considerably shorter than the head and pronotum combined; articulated near the eyes under the lateral ocelli, in the ♀ at least slightly ensiform and trihedral near the base. Head with concave frons; vertex projecting forward between the eyes in the form of a duck-bill, with large foveolae situated on the surface of the vertex itself and anteriorly separated by a thin groove (Figure 564). Pronotum with distinct median carina and often weaker, sometimes obsolete lateral carinae; the transverse groove is situated distinctly behind the middle; lateral lobes with sinuous ventral margin and the ventral part of the posterior margin perpendicular, not emarginate; postero-ventral angle often obliquely truncate, usually with a little triangular lobe near the end of the ventral margin. Tegmina extending beyond the distal end of the hind femora or moderarately abbreviated, but not lateral; wings not shorter than the tegmina often pinkish near the base. Prosternum in the anterior part between the front legs slightly thickened and raised, sometimes with a small tubercle there; space between the lateral lobes of the mesosternum large, trapezoidal, narrowed caudad. Hind femora narrow, long; hind tibia without external apical spine or this spine is discernible with difficulty, inner spurs distinctly shorter than the first segment of the hind tarsus.

More than 20 species are known, distributed principally in Africa and the Mediterranean countries; not many species are known from the U.S.S.R and India. Most of the species are found in 2 color forms—grayish-yellow and green. Only 2 species are examined below.

1 (2). Tegmina completely developed, extending beyond the distal end of the hind femora. Wings colorless or pink near the base. Prozona

Figure 563. Pyrgomorpha conica deserti B.-Bienko subsp. n., ♀. (Samarkand, type). (Original)



Figures 564-572
(Original)

564—Pyrgomorpha conica deserti B.-Bienko subsp. n., ♀, head and pronotum from above (paratype), 565—Atractomorpha heteroptera B.-Bienko sp. n., ♀, head and pronotum from the side (type), 566—A. heteroptera B.-Bienko sp. n., ♀, meso- and metathorax from below (type), 567—A. lata (Motsh.), ♀, ibid. (Japan, Kyoto), 568—A. sinensis Bol., ♀, head from above (Port-Arthur), 569—A. heteroptera B.-Bienko sp. n., ♀, ibid. (type), 570—A. lata (Motsh.), ♀, ibid (Japan, Kyoto), 571—Tenuitarsus evansi Uv., ♂, head and pronotum from above, 572—T. evansi Uv., ♂, end of left hind tibia and tarsi from the side

of pronotum not more, often less, than 1.5 times longer than the metazona. Postero-ventral angles of lateral lobes of pronotum blunt or obliquely truncate, ventrally without a prolonged sharp process or with only an obtuse-angled process. Length ♂ 14.5-18.0, ♀ 22-30 mm; tegmina ♂ 13-16, ♀ 17-22 mm. *1. P. conica (Ol.)

a (d). Median carina of pronotum distinct, lateral carinae in the metazona not obsolete. Postero-ventral angle of lateral lobes of pronotum obliquely truncate or with an obtuse-angled process ventrally; if the angle is obtuse, then the antennae, counting the slightly divided third segment, as one, are 13 segmented.

b (c). Antennae short, wide, 13 segmented (counting the slightly divided third segment as one). Vertex slightly constricted just before the anterior margin of the eyes. Postero-ventral angle of lateral lobes of the pronotum obtuse, ventrally without obtuse-angled process. Described from southern France, but mixed in with other species and subspecies and its distribution has not been cleared up; probably restricted only to southern Europe. 1a. P. conica conica (Ol.)

Olivier, 1791, Encycl. Meth. Ins., VI.230 (Acrydium), Jakobson, 1905:291 (partim); Uvarov, 1927a: 166 (partim), Tarbinskii, 1940.216 (partim), Uvarov, 1943, Proc. Linn. Soc. Lond., 155-25-26, Figures 3B, 4AB.

273 c (b). Antennae 15-16 segmented, in the ♀ distinctly tapered from a widened base toward the middle part. Vertex without a constriction at the anterior margin of the eyes (Figure 564). Postero-ventral angle of lateral lobes of pronotum obliquely truncate, ventrally often with an obtuse-angled process. —Azerbaijan, Armenia, Middle Asia (except the mountains, type ♀ from Samarkand), Kazakhstan from the boundary with the Lower Volga Region to the Zaisan depression; Iran, north Afghanistan. Distribution outside the limits of the U.S.S.R. not sufficiently clarified because it has been mixed with the preceding subspecies. (Figure 563) .... *1b. P. conica deserti B.-Bienko subsp. n.

—conica Uvarov, 1927a·166 (partim); Tarbinskii, 1940·216 (partim).

d (a). Median carina of pronotum weak, here and there interrupted or obliterated; lateral carinae also weak, not emphasized in the metazona. Postero-ventral angle of lateral lobes of pronotum in the ♂ rounded, in the ♀ obliquely truncate, without distinct obtuse-angled process below. Antennae, counting the slightly divided third segment as one, 14 segmented. —Kazakhstan: Chernyi Irtysh River (!); Mongolia: central Gobi. . . . . . *1c. P. conica mongolica (Sjöst.)

Sjöstedt, 1933, Arkiv Zool., 25A, No. 3.30, tab. 20, Figure 3 (Atractomorpha).

2 (1). Tegmina abbreviated, not reaching the distal end of the hind femora. Wings in both sexes pinkish near the base. Prozona of pronotum nearly twice as long as the metazona. Postero-ventral angle of lateral lobes of pronotum obliquely truncate, in the ♀ ventrally with a prolonged acute-angled process. Length ♂ 13-17, ♀ 18-23 mm;

tegmina ♂ 7.5-10.0, ♀ 8.5-13.0. —Azerbaijan, Armenia, Georgia (Tbilisi); Asia Minor, northwestern and western Iran south to Arabistan (!), Syria. . . . .*2. P. guentheri Burr

Burr, 1899, Journ. Linn. Soc. Lond , XXVII 417, Jakobson, 1905 291, Tarbinskii, 1940 34, 216.—brachyptera Bolivar, 1884, An. Soc. Espan., XIII 427 (nec Haan), Jakobson, 1905 291.—brevipennis Bolivar, 1904, Bol. Soc. Esp. Hist. Nat., IV 456.

65. Genus Pyrgomorphella I. Bol.

Bolivar, 1904, Bol Soc. Esp. Hist. Nat., IV 457, 1909, Gen. Insect., fasc. 90, Orth Pyrgomorph. 33
Type of genus: P. sphenaroides Bol., Abyssinia.

274 Like Pyrgomorpha Serv., but differing by the greatly abbreviated, lateral, at least on the apex widely separated tegmina, at most reaching the third segment of the abdomen, and by the greatly atrophied wings; or tegmina and wings are entirely absent.

Seven species, often strongly differing from each other, are known, found from Transcaucasia, northern Iran, and the Balkans to South Africa. Some of the species, in addition to the shortened tegmina, differ sharply from the genus Pyrgomorpha Serv. by several additional characters; other species do not have such additional characters and, possibly, they should be considered as brachypterous members of the genus Pyrgomorpha Serv. In particular the new species P. predtetshenskii B.-Bienko cited below, is close to Pyrgomorpha guentheri Burr in a number of characters, but on account of the greatly shortened tegmina it must be referred to the genus Pyrgomorphella Bol. In order to solve the question of the limits and characters of the genus in question, all the species belonging to it must be revised and the type of the genus, P. sphenaroides Bol., must be carefully studied, it differs from all the other species in the complete absence of wings. This was not done here only because of the fact that, of all the known species, only 2 are cited below as found in adjacent countries, all other species are members of other faunas and were not considered below.

The two species cited below are characterized by better developed tegmina which reach the third segment of the abdomen.

1 (2). Vertex not wider than long, roundly blunted in the middle, especially in the ♀. Ventral margin of lateral lobes of pronotum sinuous. Hind tibia not darker than the body, apically without external spine. Pronotum with distinct but not very sharp lateral carinae, posterior margin slightly roundly projecting or, in the ♂, nearly straight. Tegmina 2.5-3 times longer than wide, in the ♂ with symmetrical lateral margins, in the ♀ with a sloping anterior (ventral) margin beyond the middle. Wings half the length of the tegmina, pinkish. Length of ♂ 11.4-12.0, ♀ 19.5-22.5 mm; tegmina ♂ 2.3-3.5, ♀ 4.6-5.3 mm. —Northwestern Iran: Khamadan (type ♂), Farakhan, and Kurdistan . . . . .1. P. predtetshenskii B.-Bienko sp. n.

2 (1). Vertex wider than long, blunt in the middle. Ventral margin of lateral lobes of pronotum straight. Hind tibia darker than the body, dark blue-black, with an external spine on the apex. Pronotum

with sharp lateral carinae; posterior margin roundly truncate. Tegmina medially widened, hardly reaching the beginning of the third abdominal segment; wings bright red. Length of ♂ 18-21, ♀ 29-31 mm; tegmina ♂ 3.5, ♀ 7 mm. —Yugoslavia. 2. P. serbica Br.-W.

Brunner-Wattenwyl, 1882:186, Figure 44 (Pyrgomorpha); Bolivar, 1904, Bol. Soc. Esp. Hist. Nat., IV:457, Jakobson, 1905:290 (Pyrgomorpha).

66. Genus Atractomorpha Sauss.

Saussure, 1861, Ann. Soc. Ent. France, (4) I:474; Jakobson, 1905:289; Bolivar, 1905, Bol. Soc. Esp. Hist. Nat., V:196. —Perena Walker, 1870, Cat. Derm. Salt. Brit. Mus., III·506; Jakobson, 1905:292. Type of genus: A. crenulata (Fabr.), Indo-Malayan region.

Like Pyrgomorpha Serv., but the head is more prolonged, with a long fastigium which is more than the length of the eyes. Antennae moved away from the eyes and articulated considerably in front of the lateral ocel-
275 li (Figure 565); vertexal pits slightly marked or indistinct; sides of head behind the eyes with a straight row of small tubercles (Figure 565). Pronotum nearly flat dorsally, with slight, often parallel or obsolescent lateral carinae; posterior margin of lateral lobes with arcuate notch, ventral margin straight, sloping [or beveled, chamfered, etc.] with tubercles (Figure 565). Prosternum between the front legs with a long narrow platelike process inclined caudad. The tegmina reach beyond the distal end of the hind femora, they are apically pointed. Legs long, slender; hind tibia slightly widened toward the distal end, with an external apical spine.

About 30 species, distributed in southeastern Asia and Africa, are known. A few species reach northward to Afghanistan, Japan, Korea, Manchuria, and North China, but they have not yet been found in the U.S.S.R.

Five species are cited below which are known from countries adjacent to the U.S.S.R. The following species are not included: A. psittacina Haan doubtless erroneously reported by Wu (1935) for Peking and Japan. A. crenulata F., cited by Sjöstedt (1933) from Szechwan, and A. aurivillii Bol., reported by him from southern Kansu in China and by Bolivar (1901) for Peking, which requires confirmation; the insufficiently studied A. hymalaica Bol., distributed in the Himalayas and reported for Kashmir by Kirby (1914) and by Wu for Tibet (1935); the insufficiently investigated Perena concolor Walk. from South Korea.

1 (4). Space between the lateral lobes of the mesosternum in the ♀ transverse (Figure 566), in the ♂ quadrate or slightly transverse. Fastigium short, in profile not more than 1.3 times longer than the eye or even shorter (Figure 565).

2 (3). Fastigium wide, distinctly tapering forward, less than 1.5 times longer than its own greatest width (Figure 568). Bases of antennae approaching the ocelli and situated at a distinct from them of less than the length of the first segment. Wings hardly shorter than the tegmina, extending considerably beyond the distal end of the hind femora. Posterior margin of lateral lobes of pronotum slightly emarginate [or notched, incised]; postero-ventral angle straight.

Length of ♀ 32, tegmina 26.5-28.0 mm —China to Port Arthur(!) in the north . . . . 1. A. sinensis Bol.

Bolivar, 1905, Bol. Soc. Esp. Hist. Nat., V 205.—aurivillii Jakobson, 1905 289 (partim), Sjostedt, 1933, Ark. Zool., 25A, No. 3:31.

3(2). Fastigium 1.5 times longer than its greatest width at the base (Figure 569). Base of antenna situated in the middle between the eyes and the end of the fastigium and removed from the ocellus for a distance equal to the length of the first segment (Figure 565). Wings considerably shorter than the tegmina, in the ♀ they reach only the distal end of the hind femur. Posterior margin of lateral lobes of pronotum with a strong rounded notch, postero-ventral angle acute (Figure 565). Length of ♀ 30, of tegmina 24 mm. ♂ unknown. — Manchuria Mukden . . . 2. A. heteroptera B.-Bienko sp. n.

4(1). Space between the lateral lobes of the mesosternum in the ♀ not transverse, in the ♂ often elongate [or longitudinal], in both cases often strongly tapering caudad (Figure 567).

5(8) Fastigium wide and short, slightly narrowed forward, less than 1.5 times its own width, in profile only a little longer than the eye. Base of antenna brought closer to the ocellus and situated at a distance from it of not more than the width of the first segment. Wings pinkish at the base.

6(7). Antennae in the ♀ little longer than the pronotum, their bases re-
276 moved from the ocelli not more than the width of the first segment. Tegmina longer, extending well beyond the hind genua, wings little shorter than the tegmina. Larger. Length of ♀ 34, tegmina 34 mm, ♂ not described. —China Shanghai, Taiwan (report requires confirmation). . . . . .3. A. ambigua Bol.

Bolivar, 1905, Bol. Soc. Esp Hist Nat., V 209.

7(6) Antennae in the ♀ equal to the length of the pronotum, their bases brought very close to the ocelli and situated at a distance from it less than the width of the first segment. Tegmina relatively shorter, extending beyond the hind genua for only 1/4 of their length, wings not shorter than the tegmina Hind tibiae with small weak spines. Smaller. Length of ♀ 32, tegmina 26 mm, ♂ not known. — Eastern Afghanistan . . . . 4. A. externa B.-Bienko.

Bei-Bienko, 1949, Doklady AN SSSR, (novaya seriya), LXVII 173, Figure 1c.

8(5). Fastigium long, tapered forward, not less than 1.5 times longer
277 than wide at the base (Figure 570), in profile 1.5-1.7 times longer than the eye. Bases of antennae removed from the ocelli for a distance greater than the width of the first segment. Wings very narrow, not much more than twice wider than the tegmina, not pinkish at the base Length of ♀ 21-22, ♂ 30-38 mm, tegmina ♂ 22-23, ♀ 29--35 mm [sic!] —Korea, China, Peking, Taiwan, Japan northward to Yezo [Hokkaido] Island, Ryukyu Islands (Figure 567) . . . . 5. A. lata (Motsh)

Mochul'skii, 1866, Byulleten' Moskovskogo obshchestva ispytatelei prirody, XXXIX (1)·181 (Truxalis); Jakobson, 1905·214 (Acrida). —bedeli Bolivar, 1884, Ann. Soc. Espan., XIII:69; Jakobson, 1905:289; Shiraki, 1910 50.

67. Genus Aularches Stål

Stål, 1873, Öfv. Vet. Akad. Forh., XXI (4)·51, Bolivar, 1904, Bol. Soc. Esp. Hist. Nat., IV:393, Kirby, 1914·168.

Type of genus: A. miliaris (L.).

Body large. Antennae 17 segmented, filiform, not shorter than the head and pronotum combined, articulated near the eyes, nearly below the lateral ocelli. Head short with a smooth convex apex; fastigium short, triangular, distinctly separated from the remaining part of the apex of the head, with a deep longitudinal groove; foveolae absent. Pronotum without lateral carinae; with a raised swelling in the front at the anterior margin which is superficially divided in the middle into 2 halves; with strong conical tubercles in the posterior part of the prozona; metazona hardly raised more than the posterior part of the prozona, with a sharp median carina and very coarse, thick, rugae; lateral lobes perpendicular, their ventral margin before the middle distinctly bent in the shape of a ledge; postero-ventral angle rounded, with tubercles. Prosternum medially with a small sharply triangular tubercle; thoracic plate anterior (i. e., the mesosternum) with a distinct pad-shaped flange. Tegmina fully developed, wide, with many sharply outlined rounded yellowish scarcely convex spots. Wings dark smoky. Tergites of abdomen in the middle at the posterior margin with a convex [or raised] tubercle. All tarsi with a large empodium between the claws; hind femur slightly widened with dorsal and ventral margins entire; hind tibia with external apical spine.

One variable species, distributed in the Indo-Malayan region, is known; other variations of this species are considered as independent species by some authors.

1 (1). Body yellow, with black or black-brown tinge, antennae black. Tegmina wide, brownish or greenish, extending beyond the hind genua. Abdomen ventrally with reddish transverse bands; tip of abdomen, and in the ♀ the ovipositor, also reddish. Head with the pronotum yellowish or brownish, with dark spots [or punctation] on the occiput and many dark tubercles on the pronotum (typical form); or the head and pronotum dorsally are entirely black, (var. punctatus Drury), or the pronotum is partly dark with a yellow margin (var. scabiosus F.). Length of ♂ 38-48, ♀ 50-60 mm; tegmina ♂ 37-45, ♀ 40-52 mm. —Kashmir, Tibet, India, Ceylon, Malacca Peninsula, Cambodia, Java, Sumatra . . . . 1. A. miliaris (L.)

Linnaeus, 1758, Syst. Nat. (ed. X), I 432 (Gryllus Locusta), Bolivar, 1904, Bol. Soc. Esp. Hist. Nat., IV 393, Kirby, 1914.168, Willemse, 1930, Tijdschr. Entom., LXXIII:77, Figure 41. —punctatus Drury, 1773, Illustr. Exot. Entom., II, tab. 41, Figure 4 (Gryllus Locusta), Kirby, 1914:169, Figure 112. —scabiosus Fabricius, 1793, Entom. Syst., II 51 (Gryllus), Kirby, 1914 170.

Serville, 1839, Hist Nat Ins Orthopt 702, Bolivar, 1904, Bol. Soc Espan. Hist. Nat , IV 91, Jakobson, 1905 288 Uvarov, 1927a 164

Type of genus Ch. lugubris (Blanch), Egypt

Body rough, with tubercles and granules, distinctly flattened, that is, wider than high, especially in the ♀. Antennae short, rather stout. Head short, with horizontal vertex projecting forward between the eyes; frons distinctly sloping; frontal ridge between the antennae flattened and projecting strongly forward, with a very narrow groove, sharply depressed near the median ocellus, below it weak, nearly obsolescent. Pronotum short and wide with posterior angles of lateral lobes strongly projecting laterad; prozona not longer than the metazona, laterally with 2-3 strongly projecting tubercles; metazona with linear lateral and median carinae. Body with black spots below. Prosternum medially strongly raised in the form of a plate-like collar, covering the mouth parts, space between the lateral lobes of mesosternum large, wide. Tegmina fully developed or shortened, tapered apicad, with straight veins and convex tubercles on some of them, especially on CuA. Inner spines approximately in the middle of the hind tibiae normal, closer to the distal end they are shortened, spurs only slightly elongated, but the inner pair is not longer than the first segment of the hind tarsus.

About 30 species have been described, predominantly from Africa and partly from India, one species is widely distributed in Middle Asia and partly in Kazakhstan. The systematics of the genus have not been satisfactorily worked out, the differences between species were based on degree of development of tegmina and wings and on their relative length although this character is marked by great variability and some species are represented by 2 forms-brachypterous and macropterous. In this connection, the number of species described probably far exceeds the number of true species.

Only 2 readily separated species are cited below, one of them is not found within the borders of the U. S. S. R.

279 1 (2) Anterior margin of space between the lateral lobes of the mesosternum straight or slightly concave. Vertex in profile not lowered in the form of a ledge before the eyes. Hind femora narrower, their length more than 3 times more than their own greatest width. Tegmina completely developed, reaching the distal ends of the hind femora or even longer, wings not shorter than the tegmina or hardly perceptibly shorter. Length of ♂ 13.5-16.0, ♀ 21-24 mm, tegmina ♂ 11.0-13.5, ♀ 13-15 mm. —Kazakhstan Zaisan, Alakul, valley of the Ili River to its mouth, Kzyl-Orda, Middle Asia south to Amur Darya and from its mouth to Tadzhikistan. The larvae overwinter in sandy banks of rivers (Figure 573) . . . . *1. Ch. turanicus Kuthy.

Kuthy, 1905, Ann Mus Hungar , III 217 Uvarov, 1927a 165

2(1). Anterior margin of space between lateral lobes of mesosternum strongly concave. Vertex in profile distinctly lowered before the eyes. Hind femora more thickset, hardly 3 times longer than their own greatest width, or only 3 times in the ♂. Tegmina as in the preceding; wings sometimes 2-3 mm shorter than the tegmina. Length ♂ 13.5-15.0, ♀ 19-26 mm; tegmina ♂ 8.5-11.5, ♀ 13.5-17.5 mm. —Eastern and southeastern Iran to Khorasan in the North (!); southern and eastern Afghanistan (!), Pakistan. Individuals from different places differ in details of structure of the vertex and in degree of development of the wings, and possibly are separate species . . . . 2. Ch. robertsi Kirby.

Kirby, 1914:164, Figure 111. —homalodema Jakobson, 1905:288 (nec Blanchard).

69. Genus Tenuitarsus I. Bol.

Bolivar, 1904, Bol. Soc. Esp. Hist. Nat., IV:90. —Leptoscirtus Saussure, 1888:72 (partly); Jakobson, 1905 270.

Type of genus: T. revoili Bol., Somalia.

Small, slender, with body not much flattened but slightly widened in the region of the metathorax, this being more perceptible in the ♀. Antennae 8-11 segmented with greatly elongated and slightly thickened terminal segment. Head (Figure 571) short, with nearly hemispherical eyes; vertex not projecting forward between the eyes, extending roundly over into the frons; fastigium with flat, medially contiguous, dorsal foveolae; frons slightly sloping, nearly perpendicular; frontal ridge between the antennae compressed, narrow, with a thin groove. Pronotum (Figure 571) short, with lateral lobes slightly expanded laterad, without lateral carinae and with a weak median carina; the transverse groove is near the middle. Prosternum with anterior margin strongly raised in the form of a collar covering the mouth from below; mesosternum with a large wide space between the lateral lobes; the transverse groove between these lobes absent or very weak and, in this case, straight. Tegmina and wings fully developed; tegmina narrow, with nearly parallel sides. Mid-legs long, slender; hind tibia shorter than the femora with 4-6 inner and 3-4 outer spines, without external apical spine; spurs of hind tibiae (Figure 572) very long, slender; the inner pair is considerably longer than half the tarsus; hind tarsi slender, long; empodium between the claws in the ♂ well developed, equal to half the length of the claw, in the ♀ very small, in the form
280 of a weak tubercle between the bases of the very long claws. Abdomen without tympanic organ.

From the external characters and the long spurs, this genus is very reminiscent of Hyalorrhipis Sauss. of the subfamily Oedipodinae; this similarity is an example of convergence which is sharply expressed in connection with the fact that, very likely, species of the genus Tenuitarsus Bol., similarly to Hyalorrhipis Sauss., live on sandy substrates, that is, they are psammobionts. Consequently the presence of a number of common characters in the said genera is an expression of their common mode of existence.

Two to three species, distributed from Iran to Egypt and Somalia are known. *Only one species from Iran is cited below*·

1(1). Body with dense brown and rust-colored speckles. Antennas 8-9 segmented, with dark and light rings. Wings blue. Length of ♀ 9.5-10.5, ♂ 14-15 mm, tegmina ♀ 8.8-9.0, ♂ 12-13 mm [sic!]. —Iran· Mekran (!), Laristan (!), Iraq (Figures 571, 572). . . . . 1. T. evansi (Uv.)

Uvarov, 1921, Journ Bomb Nat. Hist. Soc., XXVII:63(Leptoscirtus).

3. Subfamily PAMPHAGINAE

(Compiled by G. Ya. Bei-Bienko and L. L. Mishchenko)†

Body medium-sized or large, often very rough. Antennae filiform, ensiform, or trihedral, 12-19 segmented, the apical segment elongated. Head usually with perpendicular frons, making a right or obtuse, broadly rounded angle with the vertex, more rarely of different form, frontal ridge either with a notch under the median ocellus or it is depressed, or projects strongly forward between the bases of the antennae, or the groove of the frontal ridge extends onto the fastigium, as a result of which the latter is distinctly anteriorly cut into by this groove (Figure 574); foveolae of two types — superocellar, situated immediately above the ocelli and not anteriorly touching — preocellar situated in front of the preceding, more rarely the foveolae are absolutely unmarked, lateral ocelli distinctly moved back from the anterior margin of the eye, not contiguous with it or slightly developed. Pronotum often projecting in a point in front above the occiput. Prosternum either with the anterior margin raised like a plate or with a process or conical tubercle, or only slightly convex in the anterior part, transverse groove of mesosternum in the middle often extends caudad between the lateral lobes. Tegmina, if developed, with median field open apicad and always without the spurious median vein in it, often tegmina and wings are abbreviated or entirely absent. Hind femur (Figures 94, 668, 669, 705, 706, etc.) with irregular sculpture externally along the middle, without plumosely-arranged areas between the carinas, base of hind femur often with a strongly projecting, pointed ventral lobe and a weakly-developed shorter dorsal lobe at the place of articulation with the coxa (except for some apterous forms and the tribe Phrynotettigini peculiar to America and Australia). Hind tibiae with external apical spine, more rarely without it (for instance in Thrinchus F.-W., Strumiger Zub., Mongolot-
281 methis B.-Bienko of a number of Palearctic genera). Second segment of abdomen with a raised rough plate on the sides (Krause's organ) (Figure 96); only in perfectly wingless forms is this plate absent. ♀ cerci often small, rudimentary. Epiphallus of the ♂ in the form of a wide plate with 2 groups of spinules (Figures 24, b, c)

According to Uvarov (1943) the subfamily is divided into 9 tribes most of them peculiar to southern Africa, in the Palearctic region it is

† The tribe Thrinchini (genera 70-88) was worked out by G. Ya. Bei-Bienko, the tribe Pamphagini (genera 89-105) was worked out by L. L. Mishchenko).

Figure 573. Chrotogonus turanicus Kuthy, ♀ (Kzyl Orda). (Original)

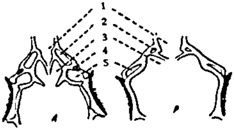


Figure 574. Vertex from above. (According to Uvarov)

A—Asiotmethis muricatus (Pall.). P—Prinotropis hystrix (Germ.) 1—frontal ridge. 2—preocellar foveolae; 3—fastigium, 4—ocellus 5—superocellar foveolae.

represented by only 3 tribes, of which only the Thrinchini which are characteristic principally for semideserts and deserts, including the outskirts of mountainous regions, and the Pamphagini, distributed in countries along the shores of the Mediterranean Sea, in the Caucasus, and in western Iran with not many species reaching the southern part of Middle Asia and with one endemic genus in the Far East, are examined below.

These two tribes were considered earlier either as independent subfamilies, or when the tribe Thrinchini was included in the subfamily Oedipodinae. However, Pamphaginae on the whole represents a natural subfamily closest to the Catantopinae on the one hand and the Pyrgomorphinae on the other.

For the most part, members of the tribe Thrinchini are typical geophiles living in the open, a few (Strumiger Zub., some species of the genus Thrinchus F.-W.) are characteristic for sandy deserts. Members of the tribe Pamphagini are usually characteristic for rocky [or stony] mountain slopes and many of them live on shrubs.

Key to Genera of the Subfamily Pamphaginae

1(38). Median carina of pronotum distinctly incised by the posterior transverse groove or sharply depressed in the metazona (Figures 577-580, 585, 590, 591, etc.). Organs of flight, completely developed or abbreviated. Middle tibia of the ♂ usually with a row of tubercles along the dorsal margin. Fastigium often broad, frequently without a small ridge along the margins, but if bordered by a ridge then often with well-marked preocellar foveolae (Figure 574). (Tribe Thrinchini).

2(35). Hind tibia with distal spine on the inner and outer aspects, or at least
282 on the inner side (Figure 575). Subgenital plate in the ♂ simple. Tegmina completely developed or abbreviated to varying degrees, if completely developed then prosternum is without the lamellately projecting anterior margin.

3(26). Prosternum without a strong lamellate process on the anterior margin. Fastigium roundly projecting forward, not anteriorly incised in the middle; but if incised then the metazona of the pronotum is at least a little longer than the prozona (Figures 585, 637). Tegmina completely developed or abbreviated.

4(11). Pronotum roof-like, its median carina, when examined from the side, at least slightly arcuate, narrowly cut into by the posterior transverse groove (Figures 577-579); metazona always convex in cross section with the middle carina raised high up.

5 (6). Body and hind tibiae bare. Hind femur with large, widely spaced, oblique, sharp teeth along the dorsal carina, empodium between the tarsal claws in the ♂ large, rounded, nearly or wholly equal to the claw in length. Median carina of pronotum sharp, plate-like, very narrowly cut into by the posterior transverse groove (Figure 577) . . . . 70 Prionotropis Fieb

6 (5). Hind tibia with dense hairs. Dorsal carina of hind femur with very small teeth or almost without them. Empodium between the claws of the tarsi small, not longer than half the claw in the ♂.

7(10). Tegmina in both sexes long, in the ♂ they reach the middle of the hind tibiae or are still longer, in the ♀ they extend *far beyond* the posterior genua. Hind femur moderately wide; the dorsal carina in profile not straight, the genicular part with arcuate dorsal margin. Vertex narrow; its width even in the ♀ not greater than the vertical length of the eye.

8 (9). Prozona of pronotum posteriorly with the lobe of the median carina (Figure 578) rounded, not turned caudad. Empodium between the claws of the tarsus very small and narrow, shorter than half the claw. Wings with a dark spot or with darkened veins on the apex; the dark band begins in the middle of the anterior margin of the wing, or the wings are dark for the greater part (*Figures* 623-626). Hind tibia brightly colored, sometimes bicolored . . . . 71. Eremopeza Sauss.

9 (8). Posterior lobe of carina of prozona narrow, pointed, and at least partly turned caudad (Figure 579). Empodium between the claws of front and middle tarsi in the ♂ wide, triangular, nearly reaching the middle of the claws. Wings transparent as glass on the apex; the dark band narrow, sometimes weak or incomplete, situated closer to the apex of the wing than to its base. Hind tibia sulfur-yellow . . . . 72. Eremotmethis Uv.

10 (7). Tegmina not so long, in the ♀ not reaching the posterior genua, in the ♂ extending slightly beyond. Hind femurs (Figure 581) unusually wide, flat; their dorsal carina high, plate-like, straight in profile, reaching to the very end of the genua and there sharply broken off; vertex wide; its width in the ♂ distinctly more than in the ♀ 1.5 times more than the vertical length of the eye. Wings blue with a wide dark band . . . . 73. Iranotmethis Uv.

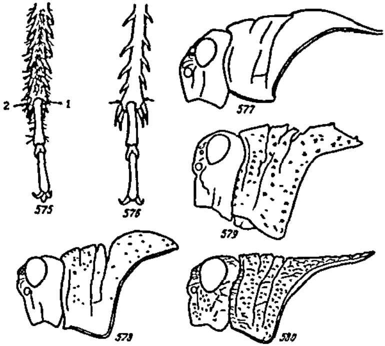
11 (4). Pronotum saddle-shaped; its median carina in profile distinctly raised in the prozona and sharply depressed on the posterior transverse groove (Figure 585), always low at the beginning of the meta-
283 zona but it may be raised *farther on* (*Figure* 637); *or the median* carina is low for all its extent, straight in profile, and the metazona is flat (Figure 580).

12(13). Median carina of pronotum with a thin longitudinal groove, low for its whole extent, straight in profile (Figure 580); metazona flat, acute-angled behind, with straight thickened margins; frontal ridge narrow, below the ocellus it is strongly narrowed toward the clypeus; fastigium projecting forward at an angle; fovolae small, weak, preocellar being vertically situated and not visible from above. . . . . 74. Eremocharis Sauss.

13(12). Median carina of pronotum without longitudinal groove, distinctly raised in the prozona, sharply lowered behind the posterior transverse groove (Figure 585), frontal ridge wide or narrow; in the latter case it does not taper toward the clypeus.

14(25). Vertex rougher, often with sharp tubercles and little ridges, Wings
284 not red at the base. Tympanic lobe covering 1/3 of the opening of the tympanic organ *or even less* (Figures 583, 584). Tegmina often greatly abbreviated.

15(16). Metazona of pronotum posteriorly acute-angled, with thickened margins. Tympanic lobe transversely quadrangular, covering 1/3 of the tympanic organ (Figure 583). Wings in both sexes black, with



Figures 575-580

(Figures 577, 578, and 580 according to Uvarov, the rest original)

575—*Asiotmethis muricatus* (Pall.), hind tibia with tarsus (1—outer apical spine; 2—inner apical spine), 576—*Thrinchus campanulatus* F.-W., ibid., arrows show the place of absent apical spines; 577—*Prionotropis hystrix* (Germ.), head and pronotum from the side, 578—*Eremopeza gibbera* (Stål), ibid., 579—*Eremotmethis carinatus* (Fabr.), ♀, ibid. (Khorasan), 580—*Eremocharis subsulcata* (Stål), ibid.

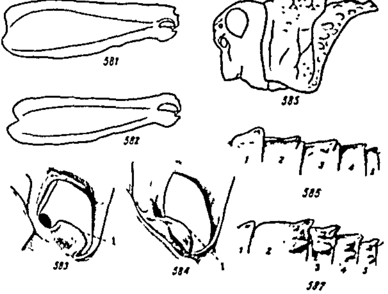


Figure 581-587
(Original)

581—Iranotmethis luteipes B.-Bienko sp. n., ♀, hind femur (type), 582—Atrichotmethis semenovi (Zub.), ♀, ibid.; 583—Melanotmethis fuscipennis (Redt.), tympanic organ (1—tympanic lobe); 584—Asiotmethis muricatus (Pall.), ibid. (1—tympanic lobe), 585—Melanotmethis fuscipennis (Redt.), ♀, head and pronotum from the side (Chuli, Kopet Dag), 586—Asiotmethis muricatus (Pall.), ♀, 1-5—1-5th abdominal tergites, 587—Glyphotmethis escherichi (Kr.), ♀, ibid.

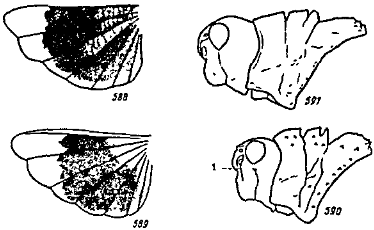


Figure 588-591
(Original)

588—Melanotmethis fuscipennis (Redt.) ♂, left wing, 589—Atrichomethis semenovi (Zub.), ♂, ibid, 590—Pseudotmethis alashanicus B.-Bienko, ♀, head and pronotum from the side (1—accessory facial carina (paratype)), 591—Mongolotmethis gobiensis B.-Bienko, ♀, ibid. (paratype).

a light apex (Figure 588). Tegmina in the ♀ moderately abbreviated, not reaching the posterior genua, but considerably longer than the pronotum . . . . 75. Melanotmethis Uv.

16(15). Metazona of pronotum posteriorly with thin or even plate-like margins; posterior angle often rounded; but if the margins of the metazona are thickened then the posterior angle is straight or obtuse. Tympanic lobe very small, triangular, or half-moon shaped (Figure 584). Wings, if developed, with a dark completely developed or shortened band, or the tegmina and wings are both sometimes greatly abbreviated.

17(20). Tegmina and wings in both sexes completely developed, extending beyond the posterior genua, or only in the ♀ abbreviated, but even then they almost reach the posterior genua. First abdominal tergite with strongly raised plate-like process along the middle; the succeeding tergites without tubercle-like processes on the sides (Figure 586).

285 18(19). More slender, almost bare, with sparse short hairs only on the hind tibiae. Hind femur slightly widened at the base, its dorsal carina straight (Figure 582). Wings with a wide, straight dark band in the form of an elongate spot (Figure 589). Vertex moderately rough, foveolae not emphasized, indistinct. . . . . 76. Atrichotmethis Uv.

19(18). Stocky, with long dense hairs on the ventral aspect of the body and the whole legs but especially on the hind tibiae. Hind femur greatly widened at the base, their dorsal carina distinctly depressed in the pregenicular part, ventral carina sinuous (Figure 94). Wings with a posteriorly widened arcuate, or with a narrow incomplete band (Figures 632-634). Vertex depressed, greatly roughened; foveolae with distinct [or sharp] margins. . . . . .77. Asiotmethis Uv.

20(17). Tegmina in the ♀ always greatly abbreviated, not longer than the pronotum, barely contiguous on the medio-dorsal line or separated. Tegmina in the ♂ abbreviated or completely developed, in the latter case the first abdominal tergite only has a low carina along the middle and the tergites following often have a tubercle-like process on the sides (Figure 587).

21(24). Metazona of the pronotum narrower, projecting posteriorly but the angle itself is often rounded, width of the metazona even in the ♀ not more than 1.5 times its own length. Tegmina widely oval, contiguous on the medio-dorsal line, or slightly separated but not lateral, or sometimes completely developed in the ♂.

22(23). Metazona of the pronotum, at least in the ♀, very thick, its margin not plate-like, posterior angle not rounded at the apex. Body with sparser and short [er] hairs. Abdomen with slightly raised folds on the posterior margins of the tergites, folds of the middle row slender [or thin], carina-like, not projecting beyond the posterior margin of the tergites. Empodium between the claws of the tarsi in the ♂ triangular, not longer than half the claw . . . . 78 Pezotmethis Uv.

23(22). Metazona of pronotum not thick, with plate-like margins, posterior angle often rounded. Body with long dense hairs, especially on all the legs including the margins of the hind femora, and often with very dense brush of hairs on the hind tibiae Abdomen, especially

in the ♀, with strong folds, on the posterior margins *of the* tergites, making 3 longitudinal rows; the folds of the middle row are acute-angular (Figure 587). *Empodium* between the claws of the tarsi in the ♂ rounded, larger, longer than half the claw. . . . . 79. Glyphotmethis B.-Bienko gen. n.

24 (21). Metazona of pronotum very wide, nearly twice as wide as long; posterior margin entire, broadly rounded. Tegmina in both sexes greatly abbreviated in the form of narrow, *completely lateral, lobules.* Empodium between the claws of the tarsi in the ♂ rounded, longer than half the claw .80. Glyphanus Fieb.

25 (14). Vertex nearly smooth, without tubercles or little ridges, anteriorly narrowly cut into by the groove of the frontal ridge; lateral margins raised a little like a pad. Wings often red at the base. *Tympanic* lobe very large, covering half the opening of the tympanic organ. *Tegmina* fully developed or only a little shortened. . . . . 81. Tmethis Fieb.

26 (3). Prosternum with strongly raised anterior margin, in the form of a plate or a bidentate process. Fastigium narrowly cut into by the
286 groove of the frontal ridge (Figures 592-594). Metazona of pronotum *not longer, often shorter, than the* prozona (Figures 590, 591, 595, 596). Tegmina abbreviated, in the ♂ not extending beyond the apex or the hind femora, in the ♀ not longer than the pronotum (Figures 639-641).

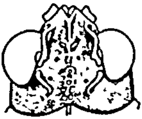
27 (32). Frontal ridge with a weak depression under the ocellus; its dorsal *part between the bases of the antennae slightly projects forward* (Figures 590, 591). Ocelli with the surface [or plane] turned forward. Vertex in profile making an obtuse, usually rounded, angle with the dorsal part of the frontal ridge (Figures 590, 591).

28 (31). Hind tibia with outer apical spine. Fastigium anteriorly strongly and deeply cut into by *the groove of the frontal ridge (Figures* 592, 593); at least the superocellar pits are well marked. Pronotum and its lateral lobes in the posterior part of the metazona with strong sharply conical pre-marginal processes (Figure 590). Abdomen dorsally near the posterior margin of the segments with strongly developed caudad-directed angular tubercles, *making one median* and 2 weaker lateral rows.

29 (30). Fastigium with straight sides convergent at an angle (Figure 592); frons outward from the antennal sockets with slightly projecting iregular supplementary facial carinae invisible from above. Tegmina in the ♂ greatly abbreviated not longer than the pronotum, but if they are longer, then slightly tapered toward the apex (Figure 640). . . . . 82. Filchnerella Karny.

30 (29). *Fastigium* with rounded sides, anteriorly blunted; supplementary
287 facial carinae very strong, plate-like, readily visible on examination of the head from above (Figure 593) and from the side (Figure 590). Tegmina in the ♂ medially very wide, greatly narrowed toward the apex (Figure 641). . . . . . . 83. Pseudotmethis B.-Bienko.

31 (28). Hind tibia usually *without an outer apical spine. Fastigium anteriorly* only slightly cut into by the groove of the frontal ridge; foveolae absent or sometimes in the ♀ only the superocellar pits are slightly visible (Figure 594). Premarginal tubercles in the metazona of



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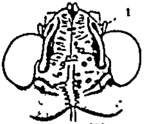

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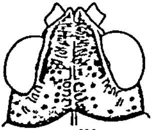

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Figures 592-594 Head from above (According to Bei-Bienko)

592—Filchnerella kukunoris B.-Bienko, ♂, (type). 593—Pseudotmethis alashanicus B.-Bienko, ♂, (paratype) (1—accessory facial carina), 594—Mongolotmethis gobiensis B.-Bienko, ♂ (type).

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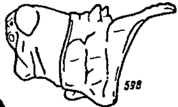

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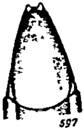

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Figures 595-599
(Original)

595—Eotmethis nasutus B.-Bienko, ♂, head and pronotum from the side (paratype). 596—Rhinotmethis hummeli Sjost., ♂, ibid (Ordos). 597—Thrinchus campanulatus F.-W., ♂, subgenital plate from below. 598—Th. campanulatus F.-W., ♀, head and pronotum from the side (Kyzyl-tepe). 599—Strumiger desertorum Zub., ♀, ibid. (Dzhebel, Turkmenia)

pronotum and on its lateral lobes low, broadly conical, often slightly developed (Figure 591). Abdomen dorsally with simple, not caudad-directed weak tubercles or they are nearly absent especially in the ♂ . . . . . 84. Mongolotmethis B.-Bienko.

32(27). Frontal ridge with a strong right-angled depression under the ocellus; its dorsal part between the bases of the antennae strongly projecting forward (Figures 595, 596). Ocelli situated on the ventral aspect of the projection and turned ventrad. Vertex in profile making a straight strongly sloping line with the projecting part of the frontal ridge (Figures 595, 596).

33(34). Projection of frontal ridge not so strong (Figure 595), shorter than the diameter of the eye; ocelli situated on the sloping ventral surface of the projection, but visible when examined from in front; lateral aspects of projection with a strong oblique ridge, parallel to the margin of the projection, from the eye to the ventral margin of the antennal sockets (Figure 595). Processes of
288 prosternum in the form of 2 acute-angled projections. ♀ antennae not much shorter than the head with the pronotum. . . . . 85. Eotmethis B.-Bienko.

34(33). Projection of frontal ridge very strong (Figure 596), in the ♂ exceeding the diameter of the eye; ocelli situated exactly on the ventral aspect of the projection and not visible from in front; lateral aspects of projection without a strong ridge. Processes of prosternum perfectly plate-like, only slightly irregularly emarginate. ♀ antennae short, hardly longer than half the length of head and pronotum combined. . . . .86. Rhinotmethis Sjost.

35 (2). Hind tibia without distal spine on the outer and inner aspects (Figure 576). Subgenital plate in the ♂ with 2 tubercles on the apex (Figure 597). Tegmina long, completely or, in the ♀ nearly, reaching the apex of the hind tibiae. Prosternum anteriorly with more or less lamellately raised anterior margin. Frontal ridge in profile roundly projecting forward between the antennae (Figures 598, 599).

36(37). Pronotum without acute-angled process on the middle of the anterior margin; ventro-anterior angle of lateral lobes almost straight or obtuse (Figure 598). Prosternum not swollen, only slightly convex in the anterior part; its anterior margin slightly or not very strongly raised . . . . 87. Thrinchus F.-W.

37(36). Anterior margin of pronotum with a strong sharp process in the middle; ventro-anterior angle of lateral lobes produced, acute (Figure 599). Prosternum swollen, its anterior margin strongly raised in the form of a plate and covering the mouth from below . . . . 88. Strumiger Zub.

289 38 (1). Median carina of pronotum never intersected by the transverse groove, it is straight or arcuate. No flight organs or they are lateral, strongly abbreviated. Middle tibiae of the ♂ without tubercles along the dorsal margin. Fastigium nearly always edged with a little ridge. No preocellar pits. (Tribe Pamphagini).

39(40). Tegmina lateral, greatly abbreviated. 89. Haplotropis Sauss.

40(39). Body entirely apterous.

41(56). Tympanic organ on the sides of the first abdominal segment large, well developed.

42 (45). Hind femur with distinct, large, pointed spines on the dorsal margin (Figures 648, 664, 668, 669).

43 (44). Frontal ridge in profile rounded, but without a depression right under the median ocellus. Vertex in profile nearly vertical (Figure 648). Hind femur slightly narrowed distad; the dorsal lobe of the femur reaches its apex, it is hardly tapered apicad; ventral lobe slightly tapered toward the distal end of the femur, its width before the genu 1/2-2/3 the greatest width of the ventral genicular lobe (Figure 648). . . . . 90. Tropidauchen Sauss.

44 (43). Frontal ridge in profile with a distinct depression right under the median ocellus with the dorsal part projecting forward. Vertex in profile moderately sloping (Figure 664). Hind femur strongly tapered distad; dorsal lobe of femur not reaching its distal end, strongly narrowed apicad; ventral lobe strongly tapered toward the distal end of the femur, its width at the genu 1/4-1/3 the greatest width of the ventral genicular lobe (Figures 668, 669) . . . . 91. Saxetania Mistsh.

45 (42). Hind femur with small denticles on the dorsal margin (Figure 711).

46 (47). Median carina of pronotum entire, without median longitudinal groove, in profile low, nearly straight (Figure 600). Mesosternum with wide transverse lateral lobes; the greatest width of the lobe is considerably greater than its length (Figure 601). . . . . 92. Ananothrotes Mistsh.

47 (46). Median carina of pronotum with a distinct longitudinal groove, sometimes it is barely noticeable or entirely absent, then the median carina of the pronotum is arcuately raised in profile (Figure 602) and the mesosternum has narrower lateral lobes; greatest width of the lobe equal to its length (Figure 603).

48 (49). The first 2, and sometimes all, the abdominal tergites with a sharp, prolonged posterior apical spine, median carina in profile pectinate (Figure 604). . . . . 93. Paranocarodes I. Bol.

49 (48). First 2 abdominal tergites simple, without sharp posterior apical spine; median carina in profile low, straight (Figure 605).

50 (55). Prosternum with slightly-developed anterior margin, not raised in the form of a collar, with a distinct median pointed process (Figure 606).

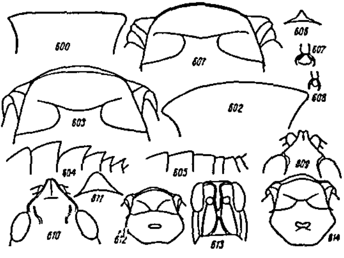
51 (52). Empodium between the tarsal claws wide, large, extending beyond the middle of the claws (Figure 607) . . . . 94. Eunothrotes Ad.

52 (51). Empodium between the claws of the tarsi narrow, small, hardly reaching the middle of the claws (Figure 608).

53 (54). Vertex in both sexes very narrow; its width between the eyes in the ♂ considerably narrower than the transverse diameter of the eye, and in the ♀ equal to it (Figure 609) . . . . 95. Pseudonothrotes Mistsh.

290 54 (53). Vertex in both sexes wide, its width between the eyes in the ♂ equal to or considerably wider than the transverse diameter of the eye, but in the ♀ twice wider than that (Figure 610). . . . . 96. Paranothrotes Mistsh.

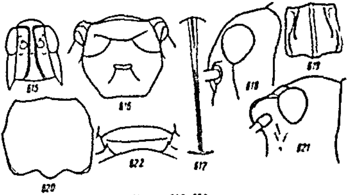
55 (50). Prosternum with strongly-developed anterior margin, raised in the form of a collar, with a wide rounded apex (Figure 611) . . . . 97. Oronothrotes Mistsh.



Figures 600-614
(Original)

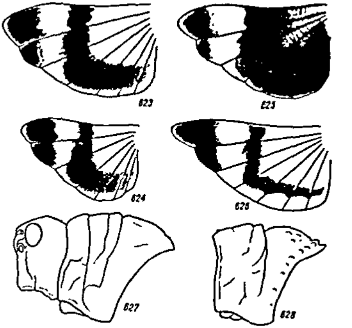
600—Ananothrotes fieberi (Br.-W.), ♀, upper part of pronotum from the side, 601—A. fieberi (Br.-W.), ♀, mesothorax from below, 602—Paranocarodes lubricus Mistsh. ♀, upper part of pronotum from the side (type), 603—P. lubricus Mistsh., ♀, mesothorax from below (type), 604—P. straubei (Fieb.), ♂, upper part of abdomen from the side; 605—Pseudonothrotes levis Mistsh., ♂, upper part of abdomen from the side (type); 606—Paranothrotes eximius Mistsh., ♂, anterior margin of prothorax from behind (type); 607—Eunothrotes derjugini Ad., ♂, empodium between the claws of right middle tarsus, 608—Pseudonothrotes levis Mistsh., ♂, empodium between the claws or right middle tarsus (type), 609—P. levis Mistsh., ♀, vertex from above (allotype), 610—Paranothrotes eximius Mistsh., ♀, vertex from above (allotype), 611—Oronothrotes furvus Mistsh., ♂, anterior margin of prothorax from behind (type), 612—Znojkiana znojkoi (Mir.), ♂, meso- and metathorax from below (paratype); 613—Araxiana voronovi (Uv.), ♂, head, front view; 614—A. voronovi (Uv.), ♂, meso- and metathorax from below.

56(41). Tympanic organ absent on the first abdominal segment.
57(58). Mesosternum with triangular lobes, gradually tapering toward the middle, posterior margin of lobes nearly straight or slightly arcuately curved. Metasternum with anterior margin slightly projecting
91 into the mesosternum; this margin is only slightly arcuately curved in the middle (Figure 612) . . 98. Znojkiana Mistshenko gen. n.
58(57). Mesosternum with trapezoidal lobes, posterior margin of the lobe sharply bent at an angle, this forming its inner lateral margin. Metasternum with anterior margin sharply, and in the middle, bent twice in the form of an angle, median process of anterior margin projecting strongly into the region of the mesosternum (Figure 603).
59(66). Hind femur with only small denticles along the dorsal margin, dorsal lobe of femur slightly developed and uniformly raised along the whole femur (Figure 734). Meso- and metasterna in the ♂ always with small scattered dots [or punctation]
60(65). Median carina of pronotum with a distinct median longitudinal groove.
61(62). Body slender. Frons in profile slightly sloping. Frontal ridge in the dorsal half nearly parallel-sided, below the median ocellus sharply diverging toward the clypeus (Figure 613). Metasternum narrow, its greatest width considerably less than the length of the meso- and metasterna together (Figure 614). . . . . 99. Araxiana Mistshenko gen. n
62(61). Body thickset. Frons in profile strongly sloping Frontal ridge gradually diverging toward the clypeus (Figure 615). Metasternum wide, its greatest width equal to or greater than the length of the meso- and metasterna together (Figure 616).
63(64). Median carina of pronotum for all its length sharply and uniformly cleft [or intersected] by the median longitudinal groove, which is not tapered toward the posterior margin of the pronotum (Figure 616) . . . . .100. Nocaracris Uv.
64(63). Median carina of pronotum distinctly intersected by the median groove only in the anterior part, median groove sharply narrowed toward the posterior margin of the pronotum (Figure 617) . . . . .101. Paranocaracris Mistshenko gen. n.
65(60). Median carina of pronotum entire, without median longitudinal groove . . . . 102. Savalania Mistshenko gen. n
66(59). Hind femur usually with a finely sinuous dorsal margin, dorsal lobe of femur usually strongly developed in the basal part, thereby forming a sharp [or distinct] preapical notch (Figure 798) More rarely in the ♂ the dorsal lobe is developed very slightly and the preapical depression is not sharp (Figure 756), then the meso- and metathorax have dense coarse dots [or punctation]
67(70). Frontal ridge in profile with the dorsal part slightly projecting forward (Figure 618). Median carina of pronotum usually without a median longitudinal groove, but if the latter is present, then it is just visible only in its anterior part. Prosternum with slightly developed anterior margin which has a distinct pointed median process.
68(69). Pronotum slightly widened in the middle part, its greatest width is equal to or distinctly less than its length, its anterior part with distinct lateral carinae, situated close to the median carina (Figure 619) . . . . .103 Nocarodes F -W.



Figures 615-622
(Original)

615—Paranocaracris elegans Mistshenko gen. et sp. n., ♂, head, *front view* (type) 616—Nocaracris cyanipes (F.-W.), ♂, meso- and metathorax from below, 617—Paranocaracris granosus Mistshenko gen. et sp. n., ♀, median carina of pronotum dorsally (type); 618—Bufonocarodes robustus Mistshenko gen. *et sp. n.*, ♀, *upper* part of the head from the side (allotype), 619—Nocarodes scabiosus Mistshenko sp. n., ♂, pronotum dorsally (type), 620—Bufonocarodes robustus Mistshenko gen. et sp. n., ♂, ibid. (type), 621—Iranacris dentatus Mistshenko gen. et sp. n., ♀, upper part of the head from the side (type), 622—I. dentatus Mistshenko gen. et sp. n., ♀, anterior margin of prothorax from behind (type).



Figures 623-628
(Original)

623—Eremopeza saussurei cyanea B.-Bienko subsp. n., ♀, left wing (paratype), 624—E. cinerascens (Stål), ♂, ibid.; 625—E. festiva (Sauss.), ♂, ibid., 626—E. gigas (Kirby), ♂, ibid.; 627—Iranotmethis cyannipennis kurdus B.-Bienko subsp. n., ♀, head and pronotum from the side (type), 628—I. luteipes B.-Bienko sp. n., ♀, pronotum from the side (type).

69 (68). Pronotum strongly widened in the median part, greatest width considerably greater than its length; its anterior part without lateral carinae close to the median carina (Figure 620) . . . . 104. Bufonocarodes Mistshenko gen. n.

70 (67). Frontal ridge in profile with the dorsal part projecting strongly for-
292 ward (Figure 621). Median carina of pronotum with a sharp median longitudinal groove for its whole length. Prothorax with strongly developed anterior margin, which is strongly raised in the form of a semicircular collar (Figure 622) . . . . 105. Iranacris Mistshenko gen. n.

70. Genus Prionotropis Fieb.

Fieber, 1853, Lotos, III 127, Uvarov, 1943b 38 —Cuculligera Fischer, 1853, Orthopt Europ 390, Jakobson, 1905 280.

Type of genus: Pr. hystrix (Germ.).

Body laterally compressed, bare, slightly roughened. Vertex (Figure 574 P) very wide, concave, edged with a thick little ridge, with transverse rugae; foveolae completely developed, the superocellar ones large, the preocellar small; frontal ridge very wide, nearly reaching the clypeus without a distinct constriction under the ocellus. Pronotum (Figure 577) in profile, arcuate; median carina high, sharply roof-shaped, nearly plate-like, narrowly cut into by the posterior transverse groove, in the prozona with one or 2 weak transverse grooves, not higher or scarcely higher than in the metazona, metazona longer than the prozona, it projects caudad in the form of a sharp angle which is rounded now and then Prosternum slightly raised in the form of a little ridge only at the anterior margin. ♀ tegmina always abbreviated, nearly or wholly lateral, in the ♂ completely developed or shortened; wings smoky, $2A_1$ and $2A_2$ strongly sinuately curved. Hind femur flattened from the sides, with sparse, rather large, oblique sharp teeth on the dorsal margin, hind tibia with long spines, empodium between the claws in the ♂ large, in the ♀ small, not longer than
293 half the claw. Membrane of tympanic organ situated on the very surface of the tergite, being slightly sunken inward only at the posterior margin, ventral margin of framework [or apodeme] of the organ with a very weak, sometimes almost unmarked lobe, Krause's organ with coarse tubercles. Median carina of abdomen terminated by a tooth at the posterior margin of the tergites; anal plate of the ♂ rough, genital plate of the ♀ with 2 deep right-angled notches behind, and a large median triangular lobe between them, ovipositor valves rather flat, especially the ventral pair, without a distinct emargination on the outer margin and without the peculiar hook-like end.

Five species, peculiar to southern Europe and Asia Minor are known, only 3 species, distributed in the Balkan Peninsula and in Turkey, are cited below.

1 (2). Middle teeth near posterior margin of tergites blunt, very short. ♂ tegmina completely developed, extending beyond the hind genua. Length of ♂ 29.0-33.5, ♀ 43-45 mm, tegmina ♂ 26.5-30.5, ♀ 4.0-6.2 mm . . . . 1. Pr. maculinervis (Stål)

a(b) Hind tibia red. Pronotum densely and finely granular, tubercles along the posterior margin (including the lateral lobes) small; posterior transverse groove strongly sloping. Wing of ♂ yellowish near the base; the dark band indistinct, interrupted, far from touching the posterior margin. —Asia Minor: Amasya. . . . . 1a. Pr. maculinervis maculinervis (Stål).

Stål, 1878, Bih. Svensk. Akad. Handl., 4(5) 28 (Cuculligera); Jakobson, 1905:281 (Cuculligera) Uvarov, 1943b:38.

b(a). Hind tibia orange or yellowish. Pronotum more coarsely granulate; tubercles along its posterior margin large; posterior transverse groove weakly sloping [or chamfered]. Wings of ♂ more broadly darkened, including the base and the posterior margin. —Southeastern part of Asia Minor: Urfa. 1b. Pr. maculinervis urfensis Rme.

Ramme, 1933, Mitt. Zool. Mus. Berlin, 18 431, Figures 9-11; Uvarov, 1943b.39.

2 (1). Middle teeth near the posterior margin of tergites long, sharp. ♂ tegmina abbreviated, not reaching the hind genua.

3 (4). Hind femur on the inside dark blue or reddish dark blue, hind tibia orange-red. ♂ tegmina longer than the pronotum, extending beyond the middle of the hind femora, in the ♀ they reach the second to the third tergites of the abdomen. Body not so rough. Length ♂ 39-44, ♀ 44-54 mm; tegmina ♂ 19.5-21.0, ♀ 10-13 mm. —Southern Italy, Balkan Peninsula: Epir. . . . .2. Pr. appulum (Costa).

Costa, 1836, Fauna Regni Napoli. Orthopt.:44, tab. 4, Figures 3A, b, c, d (Podisma). Jakobson, 1905:281 (Cuculligera), Uvarov, 1943b:39.

4 (3). Hind femora and tibiae yellow inside. ♂ tegmina strongly abbreviated, not longer than the pronotum, and not reaching the middle of the hind femurs; in the ♀ not reaching the posterior margin of the second abdominal tergite or still shorter. Body rougher . . . . 3. Pr. hystrix (Germ.)

a(b). ♂ tegmina completely covering the first 3 tergites of the abdomen; their greatest width is located before the middle, apex truncate, but rounded; ♀ tegmina extending beyond the posterior margin of the first tergite, anterior margin in the sloping [or chamfered] apical half with a distinct arcuate emargination. Length ♂ 34-41, ♀ 47-50

294 mm; tegmina ♂ 12-14, ♀ 10-11 mm. —Yugoslavia: Dalmatia. (Figure 577) . . . . 3a. Pr. hystrix hystrix (Germ.)

Germar, 1817, Reise nach Dalmatien etc.:252, tab. IX, Figures 1, 2 (Gryllus), Jakobson, 1905:281 (Cuculligera), Uvarov, 1943b 40, Figures 2, 23, 28, 40.

b(a). Tegmina shorter, in the ♂ they cover only the first 2 tergites or partially extend onto the third tergite; their greatest width is located in the middle or slightly beyond [or behind] the middle; ♀ tegmina

only reaching the posterior margin of the first tergite, without a notch or with a hardly noticeable notch in the apical half of the anterior margin. Length hardly less than the preceding species, tegming ♂ 7-9, ♀ 6.5-8.0 mm. — Julian Alps Gorizia. . . . . .3b. Pr. hystrix sontiaca Uv.

Uvarov, 1923, Ann. Soc Ent France, XCI 246, Figure 8 1943b 40

71. Genus Eremopeza Sauss.

Saussure, 1888:133 Uvarov, 1943b 41 —Eremoplana Saussure, 1884 232 (not Stål, 1871)
Type of genus: E. cinerascens (Stål)

Body distinctly compressed from the sides, more or less roughened, with hairs. Head anteriorly distinctly higher than its own width. Frontal ridge moderately widened above the ocellus, with a slight groove, strongly narrowed under the ocellus, farther down it is semi-obliterated, not emphasized near the clypeus Vertex roundly projecting forward, moderately sloping, rather narrow, its width even in the ♀ less than twice more than the meter of an eye, surface hardly depressed, but without raised lateral aspects, fastigium distinctly swollen without sharply marked anterior margin and extending roundly over to its lateral aspects, superocellar foveolae absent, preocellar pits developed or half-obliterated, often there is also a pair of adjacent [or approaching] median pits separated from each other by a groove. Pronotum usually roof-like for all its length, arcuate in profile (Figure 578) more rarely in the metazona it is only slightly convex, nearly flat and then very slightly arcuate in profile, median carina without thin longitudinal groove, in the prozona usually not higher, more rarely only slightly higher, than in the metazona, more rarely there is a thin groove on the prozona, but then the median carina is strongly arcuate, metazona distinctly longer than the prozona, posterior margin not thickened, projecting in the form of an acute or right angle which is sometimes rounded. Tegmina and wings always well developed, wings near the base colored different shades of yellow, green, or dark-blue with a distinct dark band, usually (but not always) not touching the posterior margin (Figures 623, 624, 626), or the wings are dark for the most part with a light transverse band before the apex (Figure 625), apex of the first 2 lobes with a large dark spot, more rarely only slightly darkened or only with dark veins, $2A_2$ moderately curved in an S-shape. Hind femur normal; hind tibia brightly colored. Tympanic lobe large, covering about 1/3 of the tympanic organ Krause's organ well developed with a slight rugosity. Epiphallus relatively narrow, with truncate, hardly emarginate posterior margin.

Seven species known, peculiar to Iran and adjacent countries, these are divided into a number of subspecies Only E cinerascens aurantipes Uv., from western Pakistan (Beluchistan) is cited below The systematics of
295 the genus has not been satisfactorily worked out, and the division into species and subspecies may be modifed after more detailed study.

1(12). Tip of abdomen ventrally without bright coloring. Posterior transverse groove of pronotum deeper than the 2 preceding grooves or all

3 grooves are weak, indistinct. Dark band of wings arcuate (Figures 623, 624), but if right-angled than the apex of the wing is only slightly darkened, but without a distinct dark spot; or the wings are black with a light band in the apical third (Figure 625).

2 (9). Hind tibiae on the inside an orange to a red color, only sometimes at the very base with a dark bluish speck. Eye small, rounded, distinctly shorter than the subocular space.

3 (8). Wings not black, but colored yellow, greenish, or dark blue near the base, in the middle with a black band (Figure 623, 624). Median carina of pronotum low, not arcuate; but if high it is widely cleft by the posterior transverse groove and does not form a complete arc.

4 (5). Wings dark blue or violet near the base. Hind tibiae red on the inside to the very base . . . . 1. E. saussurei (Uv.)

a(d). Wings bluish to dark blue or dark blue with a slight violet tinge near the base; apical spot of wing distinct, black, of the same intensity as the median black band. Hind tibiae bright red.

b(c). Wings near the base of different shades of dark blue, but without a violet tinge. Length of ♂ 30-33, ♀ 35-42 mm; tegmina ♂ 29-32, ♀ 34-37 mm. —Eastern and southeastern Iran: western Khorasan (type ♀), Kerman. (Figure 623) . . . . 1a. E. saussurei cyanea B.-Bienko subsp. n.

c(b). Wings dark blue with a light violet tinge near the base. Length ♂ 33, ♀ 40-46 mm; tegmina ♂ 31, ♀ 38-42 mm. —Northwestern Iran: Faragan, Kurdistan and Azerbaijan; Turkey: region of Lake Van . . . . 1b. E. saussurei saussurei (Uv.)

Uvarov, 1918, Izvestiya Kavkazskogo muzeya, XII-49, Figure 3 (Tmethis), 1943b-43. —gibber Uvarov, 1916, Izvestiya Kavkazskogo muzeya, X.183 (nec Stål) (Tmethis).

d(a). Wings bright violet near the base; apical spot of wing indistinct, not so dark as the median band. Hind tibias orange-red. Length ♂ 32-36, ♀ 37-42 mm; tegmina ♂ 29-32, ♀ 37-40 mm. —Central and southwestern Iran from the Province of Kashan to Farsistan. . . . . 1c. E. saussurei violacea (Uv.)

Uvarov, 1922, Journ. Bombay Nat. Hist. Soc., XXVIII:326 (Tmethis), 1943b-43.

5 (4). Wings yellow or bluish-green near the base.

6 (7). Hind tibiae red or blood-red, without a dark-bluish spot at the base. Median band of wings narrower, not touching their posterior margin (Figure 624). Median carina of pronotum variable; from arcuately raised to straight and low. Length ♂ 27-33, ♀ 35-40 mm; tegmina ♂ 27-32, ♀ 30-35 mm . . . . 2. E. cinerascens (Stål).

a(b). Wings sulfur-yellow near the base. —Northern Iran: northern Khorasan, Shahrud, Teheran, Gilian . . . . 2a. E. cinerascens cinerascens (Stål).

Stål, 1875, Bih. Svensk. Akad. Handl., III(14):35 (Eremobia), Jakobson, 1905-286 (Eremocharis). Uvarov, 1943b-42, Figures 4, 12, 18-48.

b (a). Wings bluish-green near the base. —Western Iran provinces of Kum and Kashan . . . . 2b. E. cinerascens virescens (Uv.)

Uvarov, 1933, Trudy Zoologicheskogo instituta AN SSSR (1932), I 212 (Tmethis) 1943b 42

7 (6). Hind tibiae light rose, with a bluish spot at the base. Median band of wings wide, touching their posterior margin. Length like that of the preceding species. —Afghanistan region of Kabul . . . . 3. E. afghana (Uv.)

Uvarov, 1940, Ann. Mag. Nat. Hist., (11) 6 57, Figure A (Tmethis) 1943b;43

8 (3). Wings black, with a light yellow transverse band only before the apex (Figure 625). Median carina of pronotum high, sharp, arcuate in profile, posterior transverse groove deep, but very narrow, as a result of which the carina almost forms a complete arc. (Hind tibiae on the inside, blood-red). Length of ♂ 29-35, ♀ 35-45 mm, tegmina ♂ 27-34, ♀ 29-39 mm. —Armenia and Nakhichevan A S S R . . . . 4. E. festiva (Sauss.)

Saussure, 1884 231 (Eremobia) Jakobson, 1905 282 (Tmethis) (partim), Uvarov, 1943b 44 —grandis Porchinskii, 1886, Trudy Russkogo entomologicheskogo obshchestva, XX III, plate XII Figures 5, 7, 9, 11 (Eremobia)

9 (2). Hind tibiae at least in the basal half, dark blue. Eyes large, elongated, their vertical length nearly or entirely equal to the subocular space.

10 (11). Head and pronotum not so rough, without distinct [or sharp] tubercles and rugae, median carina of pronotum more elevated, sharp, in the metazona it is arcuate to the posterior end (Figure 578). Hind tibiae dark blue, with a ring near the base, and the end yellowish-white. Length of ♂ 37-41, ♀ 45-55 mm, tegmina ♂ 36-39, ♀ 42-45 mm . . . . 5 E. gibbera (Stål).

a (f). Wings not yellow, distinctly darkened on the apex. Hind femur on the inside with a large blue spot at the base.

b (c). Wings black with a bluish tinge at the base and a milky-white band in the apical third. —Southeastern Turkey and northern Syria (Figure 578) . . . . 5a. E gibbera gibbera (Stål).

Stål, 1876, Bih Svensk. Vet Akad Handl , 4(5) 27 (Eremobia) Jakobson 1905 282 (Tmethis) (partly) Uvarov, 1943b 43

c (b). Wings dark blue or greenish-blue near the base.

d (e). Wings dark blue in the basal third, the dark band wide, 9 times wider than the light edge, both lobes of the wing apically black. —Southeastern Turkey, northwestern Iran Kurdistan . . . . 5b. E. gibbera lata (Uv.)

Uvarov, 1934, Eos, X 104 (Tmethis) 1943b 43

e (d). Wings darker greenish-blue than in the basal third, the dark band narrow, less than 5 times wider than the light edge; anterior lobe of wing apically black, the second lobe only darkened. —Iraq . . . . 5c. E. gibbera angusta (Uv.)

Uvarov, 1934, Eos, X·105 (Tmethis); 1943b·44.

f (a). Wings sulfur-yellow; the dark band very narrow, often interrupted;
297 apex of wing without the sharp black spot, only some veins darkened. Hind femur on the inside without the large blue spot. —Southern Iran from Khuzistan to Mekran. 5d. E. gibbera reducta (Uv.)

Uvarov, 1934, Eos, X·106 (Tmethis), 1943b·44.

11 (10). Head and pronotum rougher; median carina of pronotum less raised, in the prozona blunted, in the metazona slightly arcuately raised only in the anterior part, linear in the posterior part. Hind tibiae in the distal half or third, red, orange, or yellow, basally without a light subgenicular ring. Wings yellow near the base, the dark band wide. Length of ♂ 30-35, ♀ 39-45 mm; tegmina ♂ 26-32, ♀ 34-40 mm. —Northeastern and eastern Iran from its boundary *with the U. S. S. R. (Serakhs) to Seistan and Pakistan in the south* . . . . 6. E. bicoloripes (Mor.)

Morits, 1928, Materialy po obsledovaniya saranchevykh Severnoi Persii, Ashkhabad·44 (Tmethis);
298 Uvarov, 1943b:43.

12 (1). Tip of abdomen ventrally reddish or reddish-rusty. All 3 transverse grooves of pronotum well marked, distinct, but approximately uniform in depth. The dark band of the wings is sharply right-angled with a well marked postero-external angle, apex of wing also dark (Figure 626). *Body very large, slender. Pronotum* with a narrow linear carina. Hind tibiae blue with orange-red distal end. Wings near the base from bluish to light greenish-blue in color. Length of ♂ 37-47, ♀ 46-55mm; tegmina ♂ 40-47, ♀ 48-58 mm. —Iran from the Province of Khorasan in the north to Mekran *in the south and Isfahan in the west;* western Pakistan . . . . 7. E. gigas (Kirby).

Kirby, 1914.158 (Sphingonotus), Uvarov, 1943b 44. —hotsoni Uvarov, 1922, Journ. Bombay Nat. Hist. Soc., XXVIII·363 (Tmethis), 1933, Trudy Zoologicheskogo Instituta AN SSSR, (1932), 1.212, plate 1, Figure 2 (Tmethis).

72. Genus Eremotmethis Uv.

Uvarov, 1943b 46.

Like Eremopeza Sauss., but differs by the following characters. Body smoother but usually with scattered rounded tubercles. Frontal ridge with a deeper and narrower groove near the fastigium; foveolae absent or hardly noticeable in individuals with rougher body sculpture. Pronotum (Figure 579) in the prozona with a high sharply roof-shaped carina, the posterior lobe of which is very narrow, pointed, and at least partly turned downward, metazona strongly swollen, with the same high carina as in the prozona but it is arcuate, distinctly lowered anteriad to the transverse groove and backward to the posterior margin; posterior margin of metazona not platelike. Tegmina in the apical part with more regular transversely elongated cells; wings with a narrow sometimes interrupted dark band, which is farther from the base of the wing terminating almost at the base of the apical third of its anterior margin, apex without a dark spot, transparent as glass. Hind tibias sulfur-yellow on the inside. Tympanic organ as in Eremopeza Sauss. Krause's organ with small tubercles not arranged in regular rows.

In all, one widely distributed and very variable species is known, previously subdivided into several independent species or subspecies.

From the combination of its characters, this genus most resembles those species in Eremopeza Sauss. which are characterized by a strongly arcuately raised carina of the pronotum, i. e., which is raised for all its length, such as E. festiva (Sauss.) and E. gibbera (Stål); particularly close similarity to some subspecies of the latter is observed, which are characterized by the presence of a narrow sometimes interrupted band on the wings with a slightly developed dark apical spot (E. gibbera angusta (Uv.) and E. gibbera reducta (Uv.)).

1 (1). Large, often variegated by many brown spots. Wings greenish, yellowish, or dark-bluish near the base. Length of ♂ 37-45, ♀ 48-65 mm, tegmina ♂ 33-38, ♀ 45-50 mm. —Northwestern Afghanistan, lowland of the river Gerirud; Iran from the lowland wastes of Shah Rud and
299 central Khorasan farther south along the Dasht-i-Iyut desert in eastern Iran to the shores of the Indian Ocean; Pakistan; Palestine and Arabia; northern Egypt (Figure 579) . . . . 1. E. carinatus (Fabr.)

Fabricius, 1775, Syst. Ent. 288 (Gryllus), Jakobson, 1905 285 (Tmethis), Uvarov, 1943b 46 —continuata Serville, 1839, Hist. Nat. Ins Orth. 707 (Eremobia), Jakobson, 1905 286 (Tmethis) —aegyptius Uvarov, 1924, Bull Min. Agric Egypt, 41 34, Figures 41-42 (Tmethis) —moritzi Uvarov, 1929, Ann Mag Nat. Hist , (10) IV 537 (Tmethis)

73. Genus Iranotmethis Uv.

Uvarov, 1943b 45.
Type of genus: I. cyanipennis (Sauss).

Like Eremopeza Suass., but more thickset, tegmina and wings more abbreviated, tegmina in the ♂ extending slightly beyond the distal end of the hind femora, in the ♀ somewhat longer than the pronotum and reaching only the middle of the hind fomora, wings dark bluish at the base, with a diffuse [or indistinct] dark band, on the apex with dark veins but without a distinct

dark spot; vertex wider, flat, its width distinctly more than the length of the eye, especially in the ♀; eyes small, nearly round (Figure 627). Hind femurs very wide, with high, plate-like dorsal and ventral carinae; dorsal carina in profile nearly straight, without a depression before the genicular part, reaching to the very end of the genua and there sharply broken off (Figure 581). Abdominal tergites with convex ridges [or folds] before the posterior margin.

Here belong 3 insufficiently studied species and some subspecies, distributed in western Iran; the division into species and subspecies is provisional and requires verification by study of much material from different localities.

1 (2). Pronotum slightly roughened with very small dense granules and sparser (sometimes weakly expressed) tubercles. Hind tibiae in the ♂ blue, in the ♀ blue or light carmine. 1. I. cyanipennis (Sauss.)

a(b). Hind tibiae in the ♂ bluish on the inside, with a violet tinge, especially in the apical part; in the ♀ slightly light carmine; hind femur on the inside in the ♂ dark steel-blue, in the ♀ like the hind tibia or yellow. Posterior angle of pronotum straight, only in the ♀ narrowly rounded, lateral aspects of posterior margin straight; surface of pronotum with a few scattered tubercles or almost without them. Length of ♂ 37, ♀ 45 mm; tegmina ♂ 32, ♀ 18 mm. —Western Iran: Khuzistan (erroneously described from Khiva) . . . . 1a. I. cyanipennis cyanipennis (Sauss.)

Saussure, 1884·232 (Eremobia), Jakobson, 1905 283 (Tmethis), Uvarov, 1927a:158, Figure 191 (Tmethis), 1943b 45.

b(a). Hind tibiae and hind femora on the inside dark blue in both sexes.

c(d). Pronotum very finely granular, nearly without tubercles, posterior angle obtuse, lateral aspects of posterior margin straight; median carina in the metazona gradually lowering toward the posterior margin (Figure 627). Tegmina broadly oval; their greatest width almost in the middle. Length of ♀ 54, tegmina 19 mm; ♂ unknown. —Western Iran: Kurdistan (village of Khane in the valley of the Lakhidzhan) . . . . 1b. I. cyanipennis kurdus B.-Bienko subsp. n.

Uvarov, 1943b·46 (Iranotmethis sp.).

300 d(c). Pronotum with distinct tubercles, denser in the ♀; lateral aspects of posterior margin rounded, posterior angle very obtuse, in the ♀ all of the posterior margin being roundly truncate; median carina strongly lowered before the posterior margin of the metazona, in the ♀ semivertical. Tegmina in the ♀ narrowly oval, the greatest width closer to the base. Length ♂ 36-40, ♀ 38 mm; tegmina ♂ 29.0-31.5, ♀ 16 mm. —Northern Iran: Province of Teheran . . . . 1c. I. cyanipennis cyanipes B.-Bienko subsp. n.

2 (1). Pronotum rougher, in the ♀ with strong, rather sharp, and dense tubercles; median carina in the posterior part of metazona gradually depressed towards the posterior margin, especially in the ♀. Hind tibiae carmine-red or yellow.

3 (4). Pronotum in the prozona not swollen or slightly swollen, posterior margin of metazona not plate-like, median carina in the prozona distinct, *without a thin groove. Transverse groove between the lateral* lobes of the mesosternum in both sexes short, not longer than the width of each lobe. Hind tibiae and hind femora on the inside carmine red or ocher-yellow . . . . 2. I. persa (Sauss.)

a(b). Hind tibiae and hind femora on the inside ocher-yellow. Posterior margin of pronotum rounded. Tegmina in the ♀ longer, nearly equal to the hind femurs (but not reaching their distal ends). Length of ♂ 37, of ♀ 51 mm, tegmina ♂ 31, ♀ 23 mm. —Northern Iran Azerbaijan (Lake Urmia), Faragan . . . . . . .2a. I. persa persa (Sauss.)

Saussure, 1888 127 (Eremobia) Jakobson, 1905 283 (Tmethis) Uvarov, 1918, Izvestiya Kavkazskogo muzeya, XII 50, Figure 4 (Tmethis), 1943b 45.

b(a). Hind tibiae and hind femora on the inside carmine-red. Posterior margin of pronotum obtuse-angled, with slightly rounded or nearly straight lateral aspects, the posterior angle itself sometimes slightly rounded, especially in the ♀. Tegmina in the ♀ considerably shorter than the hind femora. Length of ♂ 34-40, ♀ 52-55 mm, tegmina ♂ 28-31, ♀ 20-21 mm. —West Iran from Faragan and Kermanshah south to Khuzistan . . . . 2b. I. persa zagrosi (Uv.)

Uvarov, 1933, Trudy Zoologicheskogo Instituta AN SSSR, I 213 (Tmethis) 1943b 45

4 (3). Pronotum in the prozona greatly swollen, thick, posterior margin of metazona thin, plate-like (Figure 628), with an obtuse, broadly rounded posterior angle, median carina in the posterior part of the prozona effaced and replaced by [or changed into] a thin groove, extending partly across the posterior transverse groove. Space between the lateral lobes of the mesosternum very wide, length of the transverse groove between them 1.5 times more than the width of each lobe. *Hind tibiae and hind femora lemon-yellow on the inside Length of ♀ 54, tegmina 19 mm, ♂ unknown. —Northwestern Iran Kashan* . . . . 3. I. luteipes B.-Bienko sp n

74. Genus Eremocharis Sauss

Saussure, 1884 233, Uvarov, 1933, Trudy Zoologicheskogo instituta AN SSSR, 1932), I 218 1943b 47
Type of genus E. subsulcata (Stål)

Like Eremopeza Sauss., but differs by the following characters. The vertex projects forward at an angle, in the ♀ twice as wide, in the ♂ less
301 than twice as wide as the diameter of the eye, lateral aspects raised, at least slightly, fastigium not swollen, its dorsal aspect slightly concave or flat, making a distinct *angle with the lateral aspects, superocellar* and preocellar pits small, weak, the latter vertically situated and imperceptible from above. Pronotum (Figure 580) in the prozona slightly roof-shaped, in

the metazona flat and often slightly depressed along the sides of the median carina; posterior margin acute-angled, thickened; *median carina* very low, in profile perfectly straight, gradually weakening caudad, with a distinct thin groove at least in the prozona. Tegmina and wings sometimes slightly abbreviated; the dark band of the wings, if completely developed, touches their posterior margin, or it is often undeveloped or even broken up into separate spots; apex of the 2 anterior *lobes of the wing* never darkened. Epiphallus transverse, with very slightly noticeable wide processes behind.

A total of 4 species are known, one of which is not cited; it is peculiar to northwestern India. One more widely distributed species (E. granulosa (Walk.)), peculiar to western Pakistan (Beluchistan), adjacent Iran and Afghanistan, *is subdivided into* a number of subspecies, which are difficult to separate; of these only 3 are cited, as they are distributed closer to the borders of the U. S. S. R.

1 (2). Inner spines of hind tibiae black only on their ends. Wings sulfur-yellow with a distinct wide dark band, touching the posterior margin, but without signs of the inner radial branch [or fork] at the anterior margin (Figure 631). Tegmina and wings fully developed in both *sexes, in the ♂ reaching the distal end of the hind tibiae, somewhat* shorter in the ♀. Hind femora below and on the inside, and hind tibiae whitish-yellow. Length of ♂ 37-40, ♀ 50-60 mm; tegmina ♂ *34-39*, ♀ 46-49 mm. —Northern Iran: Provinces of Shah Rud and Khorasan . . . . 1. E. subsulcata (Stål).

Stål, 1875, Bih. Svensk. Akad. Handl., III(14) 35 (Eremobia); Jakobson, 1905:287; Uvarov, 1933, Trudy Zoologicheskogo Instituta AN SSSR, (1932), 1-220, plate I, Figure 3; 1943b 48, Figures 5, 16, 17.

2 (1). *Inner spines of hind tibiae solid black on the inside. Wings yellowish,* greenish, or dark bluish; the dark band often indistinct, sometimes interrupted or nearly obsolete, or with an inner radial branch along the anterior margin.

3 (4). Sexual dimorphism not sharp; tegmina in the ♀ developed nearly as in the ♂, reaching almost to the posterior genua or even longer . . . . 2. E. granulosa (Walk.)

a (b). The dark band of the wings *touches the* posterior margin and *sends* a short branch off toward the base of the wing. Hind tibiae in the basal 2/3 steel-blue, *in* the apical third red. Body not so large; tegmina in the ♂ not reaching the middle of the hind tibiae. Length ♂ 31, tegmina 27 mm; ♀ unknown.—Afghanistan: 50 km south of Kabul. . . . . 2a. E. granulosa clavicornis Rme.

Ramme, 1939, Mitt. Zool. Mus. Berlin, 24:134, Figure 54, tabl II, Figure 1, Uvarov, 1943b-49.

b (a). The dark band of the wings weak, abbreviated, not reaching the posterior margin and without *signs of the radial* branch, in the ♀ nearly obsolescent. Hind tibiae on the inside, whitish, bluish or dark blue. Body larger.

302 c (d). Tegmina longer, in the ♂ extending beyond the middle of the hind tibiae, in the ♀ *not* extending far beyond the posterior genua. Wings greenish-yellow near the base; the dark band strongly abbreviated, crossing

only 2 anterior lobes of the wing. Hind tibiae bluish or dark blue on the inside. Length of ♂ 40-45, ♀ 52-60 mm; tegmina ♂ 36-39, ♀ 35-38 mm. —East Iran provinces of Khorasan, Kerman, and Seistan . . . . 2b. E. granulosa khorasana Uv.

Uvarov, 1933, Trudy Zoologicheskogo Instituta AN SSSR, (1932), I 214, plate I, Figure 1, 1943b 50

d(c). Tegmina shorter, in the ♂ they extend beyond the posterior genua, but do not reach the middle of the hind tibiae; in the ♀ they only reach the hind genua. Wings greenish-blue at the base. The dark band sometimes extending slightly caudad beyond the second lobe of the wing. Hind tibiae whitish on the inside. Length of ♂ 40-46, ♀ 45-55 mm, tegmina ♂ 33-35, ♀ 26-30 mm. —Southeastern Iran Iranian Baluchistan and Seistan . . . . 2c. E. granulosa bampura Uv.

Uvarov, 1933, Trudy Zoologicheskogo Instituta AN SSSR, (1932), I 216, plate I, Figure 4, 1943b 50

4 (3). Sexual dimorphism sharp, tegmina in the ♂ fully developed, nearly reaching the middle of the hind tibiae, in the ♀ greatly abbreviated, not reaching the hind genua for some distance. The dark band of the wings fully developed, wide, touching the posterior margin, base of wings yellowish. Hind femurs on the inside ventrally, rosy. Length of ♂ 40.5, ♀ 53-7-54.2 mm, tegmina ♂ 30.5, ♀ 25.5-25.7 mm. —Afghanistan· Kabul . . . . 3. E. afghana Rme.

Ramme, 1928, Deutsch Ent Zeitschr, 1928 299, tab VII Figure 3ab, Uvarov, 1943b 51

75. Genus Melanotmethis Uv.

Uvarov, 1943b 60

Close to Asiotmethis Uv., but similarly to Eremocharis Sauss., it has the metazona of the pronotum projecting acutely angularly backwards, with straight thickened posterior margins, and a large roundly-quadrangular tympanic lobe (Figure 583) It differs from Eremocharis Sauss in the more distinctly anteriorly notched fastigium, the dorsal aspect of the latter extends roundly over to the lateral aspects, preocellar foveolae large, distinctly outlined, median carina of pronotum without a groove for its whole extent, prozona not greatly but distinctly raised and swollen along the median carina, falling off sharply caudad into the posterior transverse groove (Figure 585), dorsal carina of hind femur not sinuous, finely toothed and without separate larger teeth, wings black, except the apical part It differs from Asiotmethis Uv. in the less sloping vertex which distinctly projects forward, by the thicker metazona of the pronotum with straight posterior margins projecting caudad in the form of an acute angle, by the larger tympanic lobe (Figure 583) and by the absence of acute angular creases [or folds, ridges, etc] in the middle of the posterior margin of the abdominal tergites, very small empodium situated at the very base of the claws, by

the non-sinuous (dorsal and ventral) carinae of the hind femur; and by the coloring of the wings. Epiphallus transverse, with a transverse quadrangular median lobe behind.

303 One species is known — M. fuscipennis (Redt.) which has been subdivided into 2 subspecies.

1 (1). Gray or yellowish-brown. Pronotum granulate; median carina in the metazona thin, low, but distinct; in the prozona when examined in profile it is arcuate, slightly cleft. Tegmina in the ♂ extending moderately beyond the hind genua, in the ♀ not reaching them. Length of ♂ 27-34, ♀ 37-47 mm; tegmina ♂ 22-28, ♀ 18-22 mm. (Figures 583, 585). . . . . *1. M. fuscipennis (Redt.)

a(b). Hind tibiae blue on the inside, except for the light base and the red apical fourth. Pronotum more densely granulate. —Turkmenia: Uzun-ada on the Caspian Sea, north slopes of the Kopet Dag, Farab; Uzbekistan: Golodnaya Steppe. (Figure 629). . . . . *1a. M. fuscipennis fuscipennis (Redt.)

Redtenbacher, 1889, Wien. Ent. Zeitg., VIII.28 (Eremobia). Jakobson, 1905.285 (Tmethis). Uvarov, 1927a:156, Figure 185 (Tmethis). 1943b 61.

b(a). Hind tibiae on the inside monochromatic purple-red. Pronotum less coarsely granular. —Southern Turkmenia: Firyuza in the Kopet Dag; northeastern Iran (Khorasan) . *1b. M. fuscipennis unicolor (Uv.)

Uvarov, 1933, Trudy Zoologicheskogo instituta AN SSSR, (1932), I-213 (Tmethis), 1943b:61.

76. Genus Atrichotmethis Uv.

Uvarov, 1943b:51.

Like Asiotmethis Uv., but differs by the more slender, slightly rugose, nearly bare body, with sparse hairs only on the hind tibiae, by the hardly convex fastigium and nearly flat vertex, with shallow, usually indistinctly outlined foveolae, by the narrower hind femora (Figure 582), the dorsal carina of which is straight in profile and the ventral barely sinuous; by the absence of sharply projecting folds in the middle of the posterior margin of the abdominal tergites and by the longer and slightly curved cerci in the ♂; tegmina and wings completely developed in both sexes; the wings with a wide black band which is sharply outlined even on the inner side (Figure 589); $2A_1$ and $2A_2$ slightly curved, $2A_2$ extending almost along the middle of the second lobe of the wing.

304 This genus is somewhat reminiscent of Eremopeza Sauss. in the structure of the vertex and the laterally compressed slender body, but resembling Iranotmethis Uv. in the profile of the dorsal carina of the hind femora.

Only 1 species is sufficiently well-known. Another species was described from one ♂ completely like the genotype under the name of Tmethis zaitzevi Uv. (Uvarov, 1918) from Georgia (Tbilisi, Botanical Gardens); this

species appears to be a synonym of A. semenovi (Zub.) and its report for Tbilisi was based on an incorrectly made-up label.

1(1). Hind tibiae red; hind femora on the inside along the ventral margin orange-red, in the basal half between the carinae dark bluish; ventral genicular lobe with a red spot. Metazona of pronotum with a slight thin median carina and longitudinal rugae. Base of wings slightly bluish or greenish. Length of ♂ 29-32, ♀ 42-50 mm; tegmina ♂ 25-28, ♀ 33-37 mm. —Turkmenistan· in all the south; southwestern Tadzhikistan in the east to the River Vakhsh; Uzbekistan in the north to Dzhizak and the Golodnaya Steppe; northern Afghanistan. (Figures 582, 589) . . . . 1. A. semenovi (Zub.)

Zubovskii, 1899, Trudy Russkogo entomologicheskogo obshchestva, XXXII 581 (Eremobia), Jakobson, 1905 284 (Tmethis) Uvarov, 1927a 156, Figure 184 (Tmethis), 1943b 52, Figure 49. —? zaitzevi Uvarov, 1918, Izvestiya Kavkazskogo muzeya, XII 52, Figure 6 (Tmethis)

77. Genus Asiotmethis Uv.

Uvarov, 1943b-52, Shumakov, 1949 321.
Type of genus: A. muricatus (Pall.).

Body rather wide, strongly rugose, with dense hairs (Figure 630). Head when examined from the front, hardly narrowed upward; its height (counting from the ventral margin of the frons) not greater than the width in the ventral part, eyes strongly convex, nearly round, in the ♂ hemispherical, frontal ridge wide, not laterally compressed and slightly projecting above the level of the frons, with a distinct groove under the ocellus, which is situated lower than the level of the ventral margin of the eyes, vertex strongly sloping, with distinct tubercles or rugulae, concave, wide, in the ♂ nearly twice, in the ♀ 2 or even more times wider than the diameter of the eyes, hardly or not at all projecting forward [or in front], posteriorly sharply delimited by oblique postocular ridges, medially without longitudinal carinae or grooves. Superocellar foveolae with sharply expressed carina-like margins, situated nearly in the flat part of the vertex, preocellar pits also well delimited, large (Figure 574). Pronotum in the prozona with strongly raised tri-lobate, posteriorly sharply lowered median carina, metazona considerably longer than the prozona and usually longer than its own width on the shoulders, in cross section it is flat or slightly convex, lowered in front behind the posterior transverse groove, posterior margin thin, plate-like, with slightly concave, more rarely straight lateral aspects, the posterior angle often narrowly rounded; transverse groove of mesosternum arcuately curved in the middle. ♂ tegmina always completely developed, in the ♀ sometimes abbreviated, but longer than the pronotum, wings not shorter than the tegmina, $2A_1$ and $2A_2$ strongly curved, dark band present in the ♂ sometimes with indistinct margins, restricted towards the inside of the transparent field, apical part without a dark spot (Figures 632, 633). Hind femora often with sinuous dorsal and ventral carinae, hind tibiae with
305 rather dense hairs, but without a brush on the inner aspect, empodium between the claws small, even in the ♂ it is not longer than half the claw, and in the ♀ it is still shorter. Abdomen on the first tergite with small but

distinctly raised plate-like process along the middle (Figure 586); remaining tergites with an acute angular or low carina-like process at the posterior margin; these processes form 1 median line on the abdomen. Tympanic organ moderately depressed; tympanic lobe small (Figure 584); Krause's organ well marked, with dense tubercles; posterior margin of subgenital plate of the ♀ with a slight or moderate process in the middle; epiphallus in the ♂ strongly transverse, without process on the apex.

Nine species known, which are partly subdivided into subspecies. The differences between the species are not distinct, which makes determination difficult; besides this, it is necessary to have both sexes when determining some species.

1 (6). Wings yellowish or greenish near the base; the dark band incomplete or divided into separate spots in both sexes; posterior part of wing not darkened (Figure 632). Body strongly roughened; pronotum with dentate lateral carinae.

2 (3). Hind femora on the inside for the greater part, and the hind tibiae blue or violet. Vertex in the ♂ strongly, in the ♀ slightly, depressed, in profile very sloping, making with the dorsal part of the frontal ridge a common, strongly sloping but straight line. ♀ tegmina always completely developed, extending beyond the distal end of the hind femora. Length ♂ 23-28, ♀ 30-38 mm; tegmina ♂ 20-25, ♀ 23-30 mm . . . . *1. A. muricatus (Pall.)

a(d). Hind tibiae violet on the inside. Hind femora with a considerable part red on the inside, often they are also red ventrally.

b(c). Hind femora with a dark spot occupying 3/4 of its length on the inside; only the distal fourth and the ventral aspect are red. —European part of the U.S.S.R.: Orenburg steppe; Kazakhstan: from the Ural to the Kustanai, Atbasar, and Akmolinsk; Western Siberia: southern Transurals in the north to Troitsk: (Figures 574-A, 575, 584, 586, 630, 632) . . . . . *1a. A. muricatus muricatus (Pall.)

Pallas, 1771, Reise versch. Prov. Russ. Reichs, I 446 (Gryllus), Jakobson, 1905:283, plate X (Tmethis), Uvarov, 1927a:155, Figures 174-175, 193 (Tmethis); 1943b 53, Figures 1, 9, 20, 26, 29, 51; Shumakov, 1949:322.

c(b). Hind femora on the inside dark only in the basal half, the distal part
306 red. —Northern part of central Kazakhstan: from Akmolinsk to Karanganda and the upper course of the Sary-su (!) . . . . *1b. A. muricatus rubripes Shum.

Shumakov, 1949·322.

d(a). Hind tibiae on the inside and usually partly ventrally dark blue, nearly black. Hind femora on the inside, except the distal fourth, also dark blue or nearly black; distal fourth light, often with an admixture of a red color. —Eastern Ciscaucasus, Lower Volga Region and Kazakhstan: from the Caspian lowland, the lower course of the Syr Darya and the northern extremity of the Karatau Mts. to Karsakpai and the middle course of the Sary-su (!) . . . . *1c. A. muricatus australis (Tarb.)

Tarbinskii, 1930, Konowia, IX 188 (Tmethis), Uvarov, 1943b:53, Shumakov, 1949:322.

3 (2). Hind femora on the inside for the greater part, and hind tibiae red or orange. ♀ tegmina abbreviated, not reaching the distal end of the hind femora, or completely developed.

4 (5). Wings with an entire dark band which is not divided into separate spots, yellowish only at the very base. Vertex as in the preceding species . . . . *2. A. tauricus Tarb.

a(b). Tegmina completely developed in both sexes, extending beyond the distal end of the hind femora. Larger. Length ♂ 27-28, ♀ 33-36 mm, tegmina ♂ 24-25, ♀ 28-30 mm. —Steppes of the European part of the U. S. S. R.: Ascania -Nova, Saratov, steppe region of the Crimea (?) . . . . *2a. A. tauricus steppensis Shum.

Shumakov, 1949 324

b(a). Tegmina in the ♀ shorter than in the ♂, not reaching or hardly reaching the distal end of the hind femora. Smaller. Length ♂ 23-26, ♀ 32-34 mm, tegmina ♂ 21-23, ♀ 17.5-23.0 mm. —The Crimea region of Eupatorja and Koktebel'.*2b. A. tauricus tauricus (Tarb.)

Tarbinskii, 1930, Konowia, IX 188 (Tmethis) Uvarov, 1943b 54

5 (4). Wings with the band broken up into separate spots, their bases, including the posterior part, yellow. Vertex slightly depressed, in profile, less sloping. Tegmina in the ♀ shorter, than in the ♂, not reaching the distal end of the hind femora. Length ♂ 28, ♀ 27-33 mm, tegmina ♂ 24, ♀ 12-18 mm. —European Turkey, Greek Macedonia, Dobruja . . . . 3. A. limbatus (Charp.)

Charpentier, 1845, Orth descr et dep., tab 24 (Eremobia), Jakobson 1905 285, excluding synonyms (Tmethis), Uvarov, 1943b 55

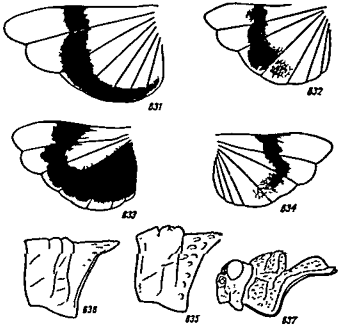
6 (1). *Wings at the bases without yellowish or greenish coloring,* the dark band in the ♂ at least, extends onto their posterior part and there is strongly widened so that the posterior part of the wing is dark (Figure 633).

7 (10) Tegmina in the ♀ considerably shorter than in the ♂, not reaching *or hardly reaching the genicular part of the hind femora.* Pronotum strongly roughened, with dense tubercles and short ridges, with dentate lateral carinae.

8 (9). Hind femora on the inside (except a violet spot near the base) and hind tibiae red. Vertex in profile less sloping, making a distinct
307 *arch with the upper part of the frontal ridge,* in the ♂ slightly depressed, in the ♀ flat. Metazona of pronotum strongly swollen along the middle part of the carina, posterior angle, at least in the ♀, broadly rounded. The dark band of the wing in the ♀ completely developed, even extending onto its posterior part. Length ♂ 28-33, *♀ 36-43 mm, tegmina ♂ 24.0-29.5,* ♀ 17.5-23.0 mm. —Dagestan, Azerbaijan, Armenia, eastern Georgia, northern Iran Azerbaijan . . . . *4. A. turritus (F.-W.)

Figure 629. Melanotmethis fuscipennis (Redt.), ♀ (Chuli, Kopet Dag). (Original)

Figure 630. Asiotmethis muricatus (Pall.), ♀ (Atbasar). (Original)



Figures 631–637
(Figure 637 according to Uvarov, the rest original)

631—Eremocharis subsulcata (Stål), ♂, left wing, 632—Asiotmethis muricatus (Pall.), ♂, ibid., 633—A. heptapotamicus (Zub.), ♂, ibid.; 634—A. zacharjini (B.-Bienko), ♀, right wing, 635—Pezotmethis nigrescens (Pyln.), ♀, pronotum from the side (type); 636—P. nigrescens crassus (Uv.), ♀, ibid. (topotype, Berk-kara), 637—Tmethis pulchripennis asiaticus Uv., head and pronotum from the side.

Fischer-Waldheim, 1838, Byulleten' Moskovskogo obshchestva ispytatelei prirody, VI 30, (Thrinchus) Uvarov, 1943b 54, Figure 41 —limbatus Fischer-Waldheim, 1846 265 (Thrinchus) (not Charpentier) —cucullatus Fischer-Waldheim, 1846 265 (Thrinchus) —biloba Stål, 1876, Bih Svensk. Akad Handl, 3(14) 35 (Eremobia) Jakobson, 1905 284 (Tmethis), Tarbinskii, 1940 212 (Tmethis)

9 (8). Hind femora dark blue-violet on the inside, with a dark red distal end, hind tibiae dark blue or violet, with a reddish base, distal
308 end, and internal spines. Vertex strongly sloping, making a straight line with the upper part of the frontal ridge, in the ♂ strongly, in the ♀ distinctly depressed. Metazona of pronotum nearly flat, with strong tubercles along the posterior margin, posterior angle narrowly rounded. Wings in the ♀ with a short weak dark band Length ♂ 26-29, ♀ 32-34 mm, tegmina ♂ 22-25, ♀ 17 5-22.0 mm. —Iran· Khorasan (Nishabur Mts) . 5. A. artemisianus Shum.

Shumakov, 1949 323, Figures 5-6

10 (7). Tegmina in the ♀ not shorter or hardly shorter than in the ♂, extending beyond the distal end of the hind femora. Pronotum greatly or moderately roughened.

11 (14). Hind tibiae violet, violet-red, or dark violet-blue on the inside, hind femora blue-black on the inside (except sometimes having a dark red distal end). Pronotum strongly roughened, with coarse plate-like tubercles, with sharp toothed lateral carinae, median carina in the metazona raised in the form of a sharp low lamella. The dark band on the wings of the ♀ also extends onto the posterior part of the wing but is less distinct than in the ♂.

12 (13). Hind tibiae on the inside violet, with a red base, or solid violet or dark blue. Hind femora red on the inside in the apical part Spines on the outer side of the hind tibiae sharp, slightly widened. Length of ♂ 28-35, ♀ 36-41, tegmina ♂ 23-27, ♀ 24-27 mm —West Siberia Kulunda Steppe northward from 53° North latitude, Kazakhstan region of Semipalatinsk; western China northern Dzungaria (Sharasume!) . . . . A. jubatus (Uv.)

Uvarov, 1926, Konowia, V 181, Figures, 3, 4, 19 (Tmethis) 1927a 155 Figures 176, 177 192 (Tmethis) 1943b 54

13 (12). Hind tibiae blue-black on the inside without a red base Hind femora on the inside distally dirty yellowish, with only a slight admixture of a dirty rose color. Spines on the outer side of the hind tibiae wider, with roundly convex sides, especially in the ♀ Length of ♂ 27.5-29.5, ♀ 43 mm, tegmina in the ♂ 23-24, ♀ 30 mm —Central Kazakhstan north Bet-Pak Dala *7. A similis B.-Bienko sp n

14 (11). Hind tibiae on the inside and hind femora (except the basal part) red or orange (very rarely in A zacharjini (B -Bienko) dark blue, but then the dark band of the wings in the ♀ is weak, not extending onto the posterior part of the wing). Pronotum slightly or strongly rugose, its median carina in the metazona low, linear, not raised in the form of a plate [or blade, lamina, flake, etc]

15 (16). The dark band of the wings well marked in both sexes, even in the

♀ it extends over into the posterior part of the wing. Hind tibias from orange to red in color. Pronotum slightly or strongly rugose. Body not so large on the average (Figure 633) . . . . *8. A. heptapotamicus (Zub.)

a (d). Dorsal margin of median carina of pronotum in profile not horizontal; its anterior lobe strongly sloping.

b (c). Hind tibias on the inside orange or orange-red. Pronotum strongly rugose, in the metazona with sharp raised tubercle-like little ridges, strongly depressed on the transverse groove; lateral carinas sharp, dentate. *Length of* ♂ 21-28, ♀ 27-35 mm; tegmina ♂ 17-24, ♀ 21-26 mm. —Kazakhstan: from the southeastern part of the Balkhash Region to the northern slopes of the Ketmen Mts., the Trans-Ili- and Kirghiz Ala Tau, and to the Talass and Dzhambul [Aulie Ata] on the west, Chu-Ili Mts. to the Chu River; Kirghizia: Frunze and the western part of the Talass valley. . . . . *8a. A. heptapotamicus heptapotamicus (Zub.)

Zubovskii, 1898, *Ezhegodnik Zoologicheskogo muzeya AN*, III:103 (Eremobia), Jakobson, 1905:284 (Tmethis), Uvarov, 1927a:156, Figures 178, 179 (Tmethis), 1943b:54. —stummeri Kuthy, 1905, Ann. Mus. Nat. Hung., III 217 (Eremobia).

c (b). Hind tibias red on the inside. Pronotum not so rugose; metazona often flat and with distinct tubercles and rugulae; lateral carinas usually weak, not dentate. Length of ♂ 23-26, ♀ 32-35 mm; tegmina ♂ 18-21, ♀ 23-27 mm. —Kazakhstan: Alakul' depression between the northern slopes of the Dzungarian Ala Tau and the southern slopes of the Tarbagatai Range; a transition to the preceding subspecies is found here and there in the southern part. . . . . *8b. A. heptapotamicus songoricus Shum.

Shumakov, 1949:324.

d (a). Dorsal margin of median carina of pronotum in profile nearly horizontal; its anterior lobe slightly or moderately sloping; the pronotum itself slightly rugose with flat metazona; lateral carinas weak, not dentate. Tegmina in ♀ only slightly extending beyond the distal ends of the hind femurs.

e (f). Metazona of the pronotum at least in the ♂, longer, equal to its *own width at the humeri* or barely longer; median carina in prozona slightly raised, especially in the ♀. Hind femurs on the inside near the base with a violet spot; hind tibias blood-red. Length ♂ 22-25, ♀ 31-34 mm; tegmina ♂ 18-21, ♀ 22-25 mm. — Kazakhstan: Dzungarian Ala Tau near the Dzungarian Gates (River Terekty). . . . . *8c. A. heptapotamicus griseus Shum.

Shumakov, 1949:324.

f (e). Metazona of pronotum shorter, slightly shorter than its own width at the humeri; median carina in the prozona not very low even in the ♀. Hind femurs on the inside near the base without a violet spot, sometimes with only a faint violet tint; hind tibias from orange to blood-red in color.

g (h). Hind tibiae on the inside from orange to sealing wax-red in color. Length of ♂ 25-27, ♀ 30-34 mm; tegmina ♂ 20-24, ♀ 19-22 mm. — Uzbekistan Fergana, Kirghizia foot-hills of Kirghizian Ala Tau near the Ak-su River . . . *8d. A. heptapotamicus transiens (Uv.)

Uvarov, 1925, Journ. Bombay Nat. Hist Soc , XXX 269 (Tmethis) 1927a:156, 180, 181 (Tmethis)· 1943b 58.

h (g). Hind tibiae on the inside blood-red. Dimensions as in the preceding species. —Uzbekistan southwestern Fergana (village of Naiman) . . . .*8e. A. heptapotamicus extimus B. -Bienko subsp. n.

16 (15). The dark band of the wings in the ♀ very faint, short, perceptible only in the anterior part of the wing or nearly absent, the posterior part not darkened (Figure 634). Hind tibiae on the inside blood-red. Pronotum slightly rugose [i. e., roughened] with low sparse tubercles or rugulae, lateral carinae weak or absent. Body on the average
310 larger [or coarser], the tegmina extending considerably beyond the distal end of the hind femora. Length ♂ 27-29, ♀ 30-37 mm, tegmina ♂ 24.0-26.5, ♀ 24-30. —Kazakhstan Zaisan depression Chinese Dzungaria valley of the Emel' . . . .*9. A. zacharjini (B. -Bienko).

Bei-Bienko, 1926, Izvestiya Zapadno Sibirskogo otdeleniya Geograficheskogo obshchestva, V 202, Figure 2 (Tmethis), Uvarov, 1927a 156, Figures 182, 183 (Tmethis) 1943b 57, Shumakov 1949 321, Figures 1-2

78. Genus Pezotmethis Uv.

Uvarov, 1943b·59
Type of genus: P tartarus (Sauss.).

Close to Asiotmethis *Uv. and* *Glyphotmethis B -Bienko by the* structure of its tympanic lobe, its rugose vertex, and the form of its hind femora. It differs from the first genus by greatly abbreviated tegmina and wings in the ♀, and sometimes in the ♂, by the thickened posterior margin of the metazona of the pronotum, the posterior angle of which is normal or obtuse, but not rounded, by the presence in the first tergite of the abdomen of only a longitudinal median carina, not making a raised plate-like process, by the structure of the epiphallus of the ♂, which has a strong slightly emarginate process apically (Figure 24, C) It differs from Glyphotmethis B. -Bienko, in addition to the structure of the metazona of the pronotum and of the epiphallus as described above, also by the absence or weak development of lateral rows of folds [or ridges] on the dorsal aspect of the abdomen, by the thin carina-like ridges of the median row which do not project beyond the posterior margin of the abdominal tergites, by the shorter triangular empodium between the claws, the length of which is not more than half the length of the claw.

A total of 4 species are known of which 3 have been subdivided into a number of subspecies, partly regarded as independent species. The differences between some of the species and subspecies are not very distinct,

therefore it is desirable to check findings with accurately determined specimens. All species are restricted in distribution to Middle Asia and have been completely or partly adapted to mountainous country.

1 (2). ♂ tegmina nearly completely or completely developed, reaching the posterior genua or even a little longer; in the ♀ hardly longer than the pronotum or equal to it, not separated on the dorsum. Hind tibiae blue or violet, sometimes red in the ♂. Pronotum in the prozona with moderately raised median carina. Hind femora with a large blue spot in the basal 1/3 inside. Length ♂ 30-32, ♀ 35-45 mm . . . . *1. P. karatavicus (Uv.)

a(b). ♂ tegmina fully reaching the distal end of the hind femora or extending slightly beyond it. Hind femora ventrally and inside red; hind tibias red, violet, or dark blue with a red base. Length of tegmina ♂ 21-23, ♀ 10-12 mm. —Southern Kazakhstan: Karatau Range to its northwestern extremity at Dzhulek . . . . *1a. P. karatavicus karatavicus (Uv.)

Uvarov, 1912, Russkoe entomologicheskoe obozrenie, XII.212 (Tmethis), 1927a:157 (Tmethis); 1943b.60.

311 b(a). ♂ tegmina reach only the base of the hind genua. Hind femora ventrally yellow, inside—except for a dark blue spot —yellow or rather rosy; hind tibiae blue with a white base. Length of tegmina ♂ 17-19, ♀ 10.5-13.0 mm. —Southern Kazakhstan: southern part of Karatau Range eastward from Turkestan, about 1100 meters above sea level; related to the preceding subspecies by gradual transitions . . . . *1b. P. karatavicus pylnovi (B.-Bienko).

Bei-Bienko, 1941, Zapiski Leningradskogo sel'skokhozyaistvennogo instituta, 4:156 (Tmethis), Uvarov, 1943b:6.

2 (1). ♂ tegmina abbreviated, not extending beyond or extending slightly beyond the middle of the hind femora; in the ♀ often shorter than the pronotum or separated on the dorsum. Hind tibiae red or yellow; but if they have a violet tinge in the middle part then they are red at least in the distal third and near the base.

3 (4). Body very large [or coarse], stout, of yellowish tones. Carina of pronotum in the prozona very high, projecting anteriorly in the form of a distinct angle overlapping [or resting against] the occiput; metazona anteriorly strongly depressed, in profile often sloping [or beveled] downward; posterior margin very thick. Hind femora very wide; 5.9-7.0 mm wide in the ♂, 6.8-8.0 mm in the ♀. Tegmina in the ♀ entirely contiguous on the dorsum. Pronotum with coarse sharp tubercles. ♂ tegmina nearly or entirely reaching the middle of the hind femora. Length ♂ 32-41, ♀ 45-53 mm; tegmina ♂ 13-15, ♀ 12-14 mm. (Figures 16, 24, C, 638) . . . . *2. P. tartarus (Sauss.)

a(b). Hind tibiae red on the inside. —Uzbekistan to Guzar in the south and Nurat in the east, Kara-Kalpak A. S. S. R.: Turtkul; southern Kazakhstan in the north to Kzyl-Orda and margins of sands of Muyun Kum north of Dzhambul; found in lowland and partly along low foothills

Figure 638. Pezotmethis tartarus (Sauss), ♀ (Turkestan). (Original)

Figure 639. Eotmethis nasutus B.-Bienko, ♀ (paratype) (Original)

. . . . *2a. P. tartarus tartarus (Sauss.)

Saussure, 1884 229 (Eremobia), Jakobson, 1905:285 (Tmethis), Uvarov, 1927a:157, Figure 186 (Tmethis), 1943b·59, Figure 32.

b(a). Hind tibiae and hind femora on the inside yellow or barely rosy. — Western Tien Shan: *along the mountain border* from the Chatkal Range and Tashkent Ala Tau to the southeastern extremity of Karatau south of Dzhambul . . . . *2b. P. tartarus montanus (Uv.)

Uvarov, 1925, Journ. Bombay. Nat. Hist. Soc., XXX:269 (Tmethis); 1927a:157 (Tmethis) 1943b:59.

12 4 (3). Body small or moderately coarse, of brownish or gray tones. Pronotum anteriorly slightly projecting in the form of an angle; *posterior margin moderately thickened.* Hind femora narrower; in the ♂ 5.0-5.6, in the ♀ 6.0-6.5 mm wide. ♀ tegmina often separated on the dorsum.

5 (6). Hind femora on the inside and ventrad yellowish, dark blue only at the base on the inner aspect; hind tibiae brick-red. Pronotum with scattered rounded tubercles, in the prozona with a rather high carina; metazona anteriorly depressed and smooth, distinctly saddle-shaped in profile. Tegmina reaching only a third of the hind femora, in the ♀ they hardly cover two segments of the abdomen. Wings light, with a darkened outer and posterior margin. Length ♂ 31-32, ♀ 41-43 mm; tegmina ♂ 8.5-9.5, ♀ 9-10 mm. —Uzbekistan: Golodnaya Steppe, Fergana valley; Kirghizia: north slopes of the Turkestan Range in the region of Sulyukta (!) . . . . *3. P. ferghanensis (Uv.)

Uvarov, 1925, Journ. Bombay Nat. Hist. Soc., XXX·271 (Tmethis), 1927a:157, Figures 188 (Tmethis), 1943b 60.

6 (5). Hind femora on the inside and often ventrad red; hind tibiae bright red or partly violet-red. Pronotum (Figures 635, 636) all with tubercles or granules, metazona in profile horizontal or gradually raised caudad, but anteriorly straight, not saddle-shaped. Wings dark with the apex and often the median part light . . . . *4. P. nigrescens (Pyln.)

a(h). Hind tibiae entirely red on the inner aspect; hind femora also red on the inside to the very base, sometimes with only a faint blue spot at the place of articulation with the trochanter.

b(c). Tegmina longer, in the ♂ they reach beyond the middle of the hind femora, being 1.5 times longer than the pronotum; in the ♀ they almost completely cover 3 abdominal segments, being contiguous on the dorsum or they are separated only by the median carina of the abdomen. Median carina of pronotum in the prozona not very low; its *posterior margin in the ♂ fully, in the ♀ nearly vertical. Length* of ♂ 27-33, ♀ 35 mm; tegmina ♂ 14.5-16.5, ♀ 10.5 mm. —Southern Kazakhstan: western foothills of Karatau Range in its middle part (east of the city of Turkestan Ak-syrke natural boundary) . . . . *4a. P. nigrescens subalatus B.-Bienko subsp. n.

Bei-Bienko, 1941, Zapiski Leningradskogo sel'skokhozyaistvenoogo Instituta, 4 156 (Tmethis nigrescens, not Pylnov)

c(b). ♂ tegmina shorter, not longer or hardly longer than the pronotum and not extending beyond the middle of the hind femora.

d(e). Median carina of pronotum in the prozona rather high, its posterior margin in the ♂ entirely, in the ♀ nearly vertical. ♀ tegmina completely contiguous on the dorsum or separated by only the median carina of the abdomen. Length ♂ 27-29, ♀ 36-41 mm, ♂ tegmina 10.5-12.0, ♀ 9.5-11.5 mm. —Southern Kazakhstan foothills of Boroldai at the southern extremity of the Karatau Range. *4b. P. nigrescens hemipterus B.-Bienko subsp. n.

e(d). Posterior margin of median carina of prozona of pronotum distinctly sloping or the whole carina in the prozona is low, hardly projecting (Figures 635, 636). Tegmina in the ♀ entirely separated on the dorsum.

f(g). Carina of pronotum in prozona distinctly projecting above the level of the metazona, at least moderately tridentate (Figure 635). Hind femora on the inside in the distal part and sometimes along the dor-
313 sal margin yellow, ventral aspect usually likewise yellow. Body in fully typical individuals small· length of ♂ 24-27, ♀ 32-37 mm, tegmina ♂ 8.0-10.5, ♀ 7.0-9.5 mm. —Southern Kazakhstan eastern extremity of Kirghizian Ala Tau southward from Dzhambul, Kirghizia· valley of the Talass River between the Kirghizia Ala Tau and the north slopes of the Talass Ala Tau in the east to 72° East longitude, 1300 meters above sea level. Related by gradual transitions to the following subspecies. *4c. P. nigrescens nigrescens (Pyln.)

Pyl'nov, 1914, Russkoe entomologicheskoe obozrenie, XIV:107, Figure 2 (Tmethis), Uvarov, 1927a 157, Figure 187 (Tmethis), 1943b 60.

g(f). Carina of pronotum in the prozona very low, in profile hardly projecting above the level of the metazona, almost unseparated (Figure 636). Hind femora on the inside almost to the dorsal carina and ventrad to the very distal end, blood-red. Larger Length of ♂ 31-35, ♀ 42-46 mm, tegmina ♂ 11-12, ♀ 8.5-11.0 mm. A transition form entirely typical in structure of pronotum but in dimensions of the body more like the preceding subspecies. —Southern Kazakhstan northwestern slopes of the Karatau south of Lake Bilyukul (Berk-kara River), Kirghizia western part of Talass valley (') . . . . *4d. P. nigrescens crassus (Uv.)

Uvarov, 1925, Journ. Bombay Nat. Hist Soc., XXX 271 (Tmethis) 1927a 158, Figure 189 (Tmethis) 1943b 60.

h(a). Hind tibiae with a violet tinge below the genicular part, genicular part and at least the distal third, red, hind femora on the inside between the inner carinae dark bluish in the basal third. Median carina of pronotum in the prozona high, posteriorly entirely vertically truncate, its height in the vertical part is only half the length of the dorsal margin. ♂ tegmina short, hardly longer than the pronotum

Length of ♂ 28.5-31.0, tegmina 9.5-10.0 mm; ♀ unknown. —Southern Kazakhstan: Kzyl-Orda . . . . *4e. P. nigrescens desertus B.-Bienko subsp. n.

79. Genus Glyphotmethis B.-Bienko gen. n.

Type of genus: Gl. escherichi (Kr.).

Like Asiotmethis Uv., but differs by the larger empodium between the claws which in the ♂ is nearly or fully equal to the claws in length and in the ♀ is not less than half their length; by the slightly curved hind tibiae, often with a dense brush of slender hairs on the inner aspect; by the short metazona of the pronotum which is barely longer than the prozona in the ♀; by the greatly abbreviated lateral ♀ tegmina; by the presence of 3 rows of acute-angular folds on the dorsal aspect of the abdomen situated at the posterior margin of the tergites, but without a plate-like process in the middle of the first tergite (Figure 587), and by the form of the ♀ subgenital plate which is terminated caudad by a large wide obtuse-angular process. It likewise resembles Pezotmethis Uv. in the degree of development of the flight organs, differing by the characters indicated in the description of this genus (cf. above); in the degree of development of the empodium between the tarsal claws and by the plate-like, caudad-rounded metazona of the pronotum it is close to Glyphanus Fieb., but differs by the more developed, broad, not lateral tegmina, by the narrower triangular metazona of the pronotum, by the wider vertex, the curved high tibiae, and often by the presence of tubercles along the dorsal aspect of the middle tibiae in the ♂.

314 A total of 4 insufficiently studied species is known, distributed in Asia Minor and Greece; several species have been subdivided into several subspecies, but some of these species and subspecies are provisionally accepted by us and require additional study. A key to all known forms is given below.

1 (6). Hind tibiae and hind femora on the inside brightly colored: red, violet, or partly blue; base of hind tibiae not narrowed or only scarcely narrowed.

2 (5). Sexual dimorphism distinct: ♂ with fully-developed tegmina (and wings) which reach the distal ends of the hind femora or are still longer. Hind femora on the inside in the basal half dark blue, violet, or—at least at the very base—with a violet-dark blue tinge. Sides of posterior part of prozona between the median and posterior transverse groove with a sharp strongly projecting tubercle.

3 (4). Hind tibiae red on the inside; ventral inner genicular lobe of the hind femora without a blue spot at the base. ♀ tegmina extending beyond the posterior margin of the first abdominal tergite or even reaching the posterior margin of the second tergite. Metazona of pronotum with an irregular premarginal ridge or tubercles at the posterior margin. Body coarser [or larger]: length of ♂ 25-29, ♀ 33-37; tegmina ♂ 19-22 mm; ♀ 6.0-8.5 mm. . . . . 1. Gl. holtzi (Wern.)

a(b). Hind femora in the ♂ dirty blue on the inside; their dorsal carina not notched or weakly notched. —Asia Minor: Cilician part of the Taurus Range . . . . 1a. Gl. holtzi holtzi (Wern.)

Werner, 1901, Sitz.-Ber. Akad. Wiss. Wien, mat.-nat. CL., 110 281 (Eremobia) Jakobson, 1905 284 (Tmethis), Uvarov, 1943b 56 (Asiotmethis)

b(a). Hind femora in the ♂ carmine-red on the inside, gradually becoming violet or violet-red toward the base.

c(d). Hind tibiae with a dense brush of slender hairs on the inside which are unicolored carmine-red. Hind femora in the ♀ carmine-red on the inside in the distal half, violet or dark violet in the basal half. —Asia Minor· Anatolian Plateau southwest of Ankara (possibly a synonym of the preceding) . . . . . 1b. Gl. holtzi dimorphus (Uv.)

Uvarov, 1934, Eos, X 109, Figure 33D (Tmethis) 1943b 56 (Asiotmethis).

d(c). Hind tibiae on the inside without the dense brush of hairs, but with dense hairs along the dorsal aspect, in the distal third being red, in the remaining part with a violet tinge. Hind femora in the ♀ on the inside dark blue, distally yellow. ♂ wings yellowish, with a diffuse dark band. Length ♂ 26, ♀ 33 mm; tegmina ♂ 20.5, ♀ 8.5 mm. —Asia Minor Anatolian Plateau northeast of Ankara (Ovadiikh near Kiangri). . . . . . 1c. Gl. holtzi extimus B.-Bienko subsp. n.

4 (3). Hind tibiae dark blue on the inside, bright red in the distal third. Hind femora dark blue on the inside with a reddish-yellow pre-genicular band and with a blue base on the ventral genicular lobe, the remaining part of which has a light red spot. ♀ tegmina not extending beyond the posterior margin of the first abdominal tergite Me-
315 tazona of pronotum triangular, parabolic on the apex, with a regular premarginal ridge along the posterior margin which also extends over onto the lateral lobes. Body of smaller dimensions· length of ♂ 23, ♀ 35, tegmina ♂ 16, ♀ 6 mm —Asia Minor Anatolian Plateau southward from Ankara. . . . . 2. Gl. pulchripes (Uv.)

Uvarov, 1943b 57 (Asiotmethis)

5 (2). Sexual dimorphism not distinct both sexes with abbreviated tegmina. Hind femora inside in the basal half purple-red or bluish-black Sides of posterior part of prozona of the pronotum with a sharp or rounded tubercle, metazona without premarginal ridge or tubercles, posterior margin in the ♀ often widely rounded . . . . 3. Gl. escherichi (Kr.)

a (f). Tegmen in the ♂ nearly, or even more than, twice longer than its own maximum width. Hind femora inside purple-red in the basal half. Middle tibiae in the ♂ with tubercles along the dorsal margin

b(c). ♂ tegmina regularly spindle-shaped, that is, widened in the middle and distinctly narrowed toward base and apex each more than twice longer than its own greatest width. Tubercle on sides of posterior part of prozona of the pronotum sharp at least in the ♂. Length of

♂ 25-28, ♀ 33-38 mm; tegmina ♂ 10-12, ♀ 7-8 mm. —Asia Minor: Anatolian Plateau near Ankara. (Figure 587) . . . . 3a. Gl. *escherichi escherichi* (Kr.)

Krauss, 1896, Zool. Jahrb., Syst., IX:565, tab. 8, Figures A-D (Eremobia); Jakobson, 1905:284 (Tmethis), Uvarov, 1943b:56 (Asiotmethis).

c(b). Tegmina oval, narrowed toward the end beginning with the distal third. Tubercle on the sides of the prozona of the pronotum rounded.

d(e). Pronotum almost smooth. ♂ tegmina each more than twice as long as its own greatest width, which is located in the distal third. Hind tibiae and femora blood-red on the inside. Length of ♂ 29, ♀ 38 mm; tegmina ♂ 9, ♀ 7.5 mm. —Asia Minor: Anatolian Plateau northeast of Ankara . . . . 3b. Gl. escherichi inermis (Uv.)

Uvarov, 1934, Eos, X 108, Figure 32, I, 33, I (Tmethis), 1943b:56 (Asiotmethis).

e(d). Pronotum with round tubercles. ♂ tegmina each less than twice longer than its own greatest width, which is located about in the middle. Hind tibiae and femora carmine-red on the inside. Length, as in the preceding, but the ♀ tegmina are 9 mm long. —Asia Minor: Adalia in southwestern Anatolia. 3c. Gl. escherichi adaliae (Uv.)

Uvarov, 1928, Ent. Mitteil., XVII:176 (Tmethis), 1943b.56 (Asiotmethis).

f(a). ♂ tegmina very short, each only 1.5 times longer than its own greatest width, oval, widened in the distal fourth. Hind femurs inside in the basal half bluish-black. Middle tibiae in the ♂ dorsally smooth. Tubercle on sides of posterior part of prozona of the pronotum sharp. Length ♂ 25, ♀ 35 mm; tegmina ♂ 6, ♀ 5.5 mm. —Asia Minor: Anatolian Plateau northwest of Ankara . . . . 3d. Gl. escherichi ovipennis (Uv.)

Uvarov, 1934, Eos, X:109, Figures 32 O, 33 O (Tmethis), 1934b-56, Figures 35, 43 (Asiotmethis).

316 6 (1). Hind tibiae and hind femora yellow inside; the latter with a dark bluish or rosy spot at the base (now and then the tibiae in the ♂ are *rosy but never bright red*); base of hind tibiae distinctly narrowed. ♂ tegmina shortened. Pronotum on the sides of the posterior part of the prozona with a rounded or right-angled tubercle; posterior margin of metazona with a white edge, *roundly obtuse-angular*. Hind tibiae with a dense brush of slender hairs on the inside. . . . . 4. Gl. heldreichi (Br.-W.)

a(b). Tegmina shorter, in the ♂ they reach only the posterior margin of the second abdominal tergite; their greatest width is beyond the middle; in the ♀ they extend only a little beyond the posterior margin of the first tergite [of the abdomen] and are widest in the distal quarter. *Hind femora* inside near the base rosy. Length ♂ 31-34,

♀ 39-42 mm; tegmina ♂ 7.5-8.0, ♀ 8.5 mm. —Greece· Athens and Thessaly (Volos) . . . . 4a. *Gl. heldreichi heldreichi* (Br. -W.)

Brunner-Wattenwyl, 1882 183 (*Glyphanus*), Jakobson, 1905 282 (*Glyphanus*) Uvarov, 1943b 56 (*Asiotmethis*) (partly)

b(a). Tegmina longer, their greatest width in both sexes in the middle, in the ♂ they cover 3 abdominal segments, in the ♀ they almost reach the posterior margin of the second tergite. Hind femora inside near the base dark bluish. Length ♂ 26-28, ♀ 36-39 mm, tegmina ♂ 9.5-10.0, ♀ 9.0-10.5 mm. —Greece Salonika region. . . . . 4b. *Gl heldreichi macedonicus* B. -Bienko subsp n.

Uvarov, 1934, Eos, X:108, Figures 32H, 33H (*Tmethis heldreichi*, not Brunner).

80. Genus *Glyphanus* Fieb.

Fieber, 1853, Lotos, III 128 Jakobson, 1905 281, Uvarov, 1943b 58

Body moderately rugose, wide, with short hairs. Vertex strongly sloping in front, depressed, moderately wide, in the ♂ less than 1 5 times, in the ♀ 1.5 times wider than the diameter of the eye, posteriorly weakly bordered Pronotum short, median carina in the prozona moderately raised like a roof, indistinctly cleft into 3 lobes, metazona slightly convex, very wide, nearly twice wider than its own length, rounded on the whole posterior margin, median carina weak, thin Tegmina strongly abbreviated in both sexes, in the form of narrow, widely separated lobes, the distance between these not less than twice more than their width, wings absent. Middle tibiae in the ♂ without tubercles along the dorsal margin, hind femora with slightly sinuous ventral and finely dentate dorsal carina, hind tibiae straight, empodium between the claws large, in the ♂ nearly equal in length to the claws, in the ♀ equal to half their length Abdomen dorsally with 3 rows of angular tubercles situated at the posterior margin of the tergites, tympanic organ slightly sunken, tympanic lobe small, Krause's organ well developed, with sharp tubercles; subgenital plate in the ♀ caudally with a large, wide, obtuse-angular median process and shallow arcuate incisions on the outside of the process.

Only one species is known, from the Balkan Peninsula

317 1 (1). Yellowish-gray to brownish-rust, with a white edge on the posterior margin of the pronotum. Hind tibiae carmine-red, with rather dense hairs. Length ♂ 23-31, ♀ 40-42 mm, tegmina ♂ 4.5-6.0, ♀ 6.0-7.8 mm. —Southern Bulgaria, Greece . . . . 1. *Gl. obtusus* Fieb

Fieber, 1853, Lotos, III 129, Jakobson, 1905 282 Uvarov 1943b 59, Figures 11 44

81. Genus Tmethis Fieb.

Fieber, 1853, Lotos, III:128; Jakobson, 1905.282 (partly); Uvarov, 1927a:150 (partly); 1943b:61. — Eremobia Serville, 1839, Hist. Nat. Ins. Orth.:704 (not Stephens, 1829).

Type of genus: T. cisti (Fabr.), North Africa.

Like Asiotmethis Uv., but differing by the following characters: head in front view strongly narrowed dorsad; frontal ridge narrow, strongly compressed laterally and more distinctly projecting above the level of the frons, with a deep groove; vertex narrower, not more than 1.5 times wider in the posterior part than the diameter of the eye, anteriorly more projecting, posteriorly indistinctly delimited from the occiput, on the sides with strongly projecting margins; surface weakly or moderately rugose, strongly concave, with a thin lengthwise groove. Superocellar foveolae usually indistinct, elongate, situated on the nearly vertically sloping surface of the convex vertexal margin; preocellar foveolae absent or in the form of small depressions situated under the lateral margins of the fastigium; eyes distinctly elongate, slightly convex. Metazona of pronotum convex in cross section, wide; its length is equal to the width or even less than it. Tegmina completely developed or slightly abbreviated; wings often rose at the base; the dark band not distinct, often interrupted, anteriorly on the inside with a radial branch which is sometimes indistinct. Abdomen without acute angular folds along the middle of the posterior margin of the tergites; tympanic lobe very large, covering half the tympanic organ; epiphallus with projecting bilobate distal part.

A total of 3 species, subdivided into a number of subspecies, is known; all of them distributed in the western part of North Africa except Tm. pulchripennis Serv., the nominate form of which is known from Egypt, and the single subspecies—Tm. pulchripennis asiaticus Uv. — distributed in Hither Asia, which is the only Asiatic representative of the genus.

The species of this genus are characterized by the strongly variable sculpture of the body integuments, and the degree of development of the median carina in the metazona of the pronotum. The typical form has the median carina greatly raised like a plate in the posterior part of the metazona (Figure 637); individuals with slightly raised carina (f. incristata) or with smoother body (f. laeviuscula) differ so sharply from the typical form that some authors have been inclined to consider them as independent species.

Only the above-mentioned single Asiatic representative of the genus is cited below.

1 (1). Metazona of pronotum triangular, with straight or hardly concave lateral aspects; posterior angle distinct or slightly rounded, usually slightly dentate on the margin. Spurs of hind tibiae short, rather
318 stout; first segment of hind tarsi short, its second pulvillus not longer than the first or third. Ventral valves of ovipositor in the ♀ near the base with strongly projecting roundly convex arms (in side view) having the form of a tooth. Wings red near the base. Hind tibiae on the inside, and the ventral part of the inner aspect of the femora yellow. Length ♂ 27-31, ♀ 36-47 mm; tegmina ♂ 21-24, ♀ 27-38 mm. —Western Iran: Luristan and Kermanshah; Asia Minor: southeastern part near Urfa; Iraq, Syria, Palestine, Transjordan, Sinai (Figure 637). . . . . 1. Tm. pulchripennis asiaticus Uv.

Uvarov, 1943b-66, Figures 14, 21, 36, 69, 70, 73

82. Genus Filchnerella Karny

Karny, 1908, Filchner Exped. China-Tibet, zool. bot. Ergebn., I 36, Uvarov, 1943b 67; Bei-Bienko, 1948 13.

Type of genus: F. pamphagoides Karny.

Thickset, with hairs, especially noticeable on the legs. Vertex (Figure 592) depressed, narrow, in the ♂ equal in width to the diameter of the eye, in the ♀ less than 1.5 times more than the latter, anteriorly narrowly cut by the groove of the frontal ridge, lateral aspects of vertex edged by sharp carinae, they are straight, convergent toward the apex so that the vertex projects forward in an angle. Foveolae situated under the carina-shaped margin of the vertex; superocellar pits not closed behind; the preocellar are narrow, almost imperceptible from above. Frontal ridge narrow, with a groove, between the bases of the antennae slightly projecting forward, depressed under the ocellus, accessory [or additional] facial carinae moderately projecting, when the head is examined from above they are imperceptible or are slightly perceptible only in the ♀. Pronotum sharply roof-like from above with strongly raised median carina, making an arc, strongly incised on the posterior transverse groove, in prozona the carinae is narrowly cut into by the 2 transverse grooves, posteriorly (on the posterior transverse groove) it is distinctly truncate, that is, it has a vertical posterior margin, metazona equal in length to the prozona or slightly shorter, with sharply conical tubercles before the posterior margin, swollen along the carina, the carina itself strongly raised, arcuate in profile, beginning from the posterior transverse groove. Prosternum with a strong plate-like process which is more or less emarginate in the middle part, in the middle of the anterior margin, transverse groove of mesosternum, extending only slightly back between the lateral lobes, it is nearly straight. Tegmina strongly abbreviated, shorter than the pronotum, in the ♀ they are lateral, not contiguous on the dorsum, or the ♂ tegmina reach the supraanal plate and in this case they are slightly narrowed toward the apex (Figure 640); costo-radial field of the tegmen distinctly narrower in the middle part, but in the ♀ it is less than 1.5 times wider than the adjacent part of the field between R and 1A. Hind femora with non-sinuous carinae, dorsal carina very finely dentate, Hind tibiae with external apical spine; empodium between the claws of the tarsi in the ♂ roundly triangular, nearly equal to half the length of the claws. Krause's organ very thinly rugose. Tympanic lobe small, irregularly triangular. Abdomen dorsally with 3 rows of tubercles; tubercles of the middle row plate-like, especially in the ♀, subgenital plate in the ♀ projecting at an angle in the middle of the posterior margin.

Three species are known, distributed in China.

319 1(4). Tegmina longer (Figure 640), in the ♂ they reach the supraanal plate, in the ♀ they are longer than the metazona of the pronotum and narrowly separated on the dorsum; the distance between the tegmina in the ♀ is nearly 1/3 the width of one tegmen Wings in the ♂ with a narrow black band beginning before the end of the first lobe and extending over on the outer margin, beginning with the third lobe. Hind tibias inside in the distal third and near the base, red, the remaining part dark.

2(3). Larger. Hind femora blue-black inside, with a cherry-red ventral margin in the distal fourth; base and distal third of hind tibiae cherry-red, the remaining part blue. Tegmina in the ♂ nearly reaching the base of the genicular part of the hind femora. The dark band on the ♂ wings wider, not narrowing on the third lobe of the wing. Median carina of pronotum in the metazona in profile in the ♂ slightly, in the ♀ strongly arcuately curved. Length ♂ 30, ♀ 32.7 mm; tegmina ♂ 16.8, ♀ 6.5 mm. —China: Kansu (valley of the Dago in the environs of Lanchow, 1700-1950 meters above sea level). 1. F. beicki Rme.

Ramme, 1931, Mitt. Zool. Mus. Berlin, XVII:446, Figures 1-4, Uvarov, 1943b-68.

3(2). Smaller. Hind femora on the inside brownish-black or brown, straw-colored in the distal fourth, with reddish spot near the base of the ventral genicular lobe; base and distal third of hind tibiae reddish-orange, the remaining part dark blue-black, nearly black. Tegmina in the ♂ definitely not reaching the base of the hind genua. Dark band on the ♂ wings narrow, on the third lobe sharply [or distinctly] narrowed, nearly vanishing caudad of this lobe. Median carina of pronotum in the metazona in profile in the ♂ strongly, in the ♀ moderately arcuately curved. Length ♂ 23, ♀ 23 mm; tegmina ♂ 10.5, ♀ 5.5 mm. —China: Lake Kuku-Nor (Figures 592, 640) . . . . 2. F. kukunoris B.-Bienko.

Bei-Bienko, 1948.4, Figures 1, 5.

4(1). Tegmina very strongly abbreviated, in the ♂ shorter than the pronotum, in the ♀ shorter than its metazona and very widely separated on the dorsum. Wings of the ♂ in the front dark, in the remaining part light. Hind tibiae dark only until the middle, the distal half colored (light reddish?). Length of ♂ 18, ♀ 28 mm; tegmina ♂♀ 3.5 mm. —China: Kansu (Lanchow). . . . . 3. F. pamphagoides Karny.

Karny, 1908, cited publications:40, tab. I, Figures 9-12, tab. II, Figures 20-24; Uvarov, 1943b:68.

83. Genus Pseudotmethis B.-Bienko

Bei-Bienko, 1948:6, 13.

Like Filchnerella Karny, but differs by the strongly developed plate-like supplementary facial carinae which project in the form of vertical ribs situated at the outside of the antennal sockets (Figure 590) which are readily visible even when the head is examined from above (Figure 593); fastigium (Figure 593) with rounded sides, anteriorly though cut by the groove of the frontal ridge, blunted. Tegmina in the ♂ more abbreviated (Figure 641), reaching only the middle of the hind femora, greatly widened toward the middle, then strongly narrowed toward the apex, not more

than twice longer than the greatest width [of one tegmen], costo-radial and anal fields strongly widened, the first of them in the ♂ in the middle part of the tegmen not narrower, but in the ♀ nearly double the width of the adjacent part of the field between R and 1A.

320 The well-developed supplementary facial carinae sharply separate this genus from all the remaining members of the tribe Thrinchini and are well developed even in the youngest instars.

Only one species is known.

1(1). Head with sparse granules, dorsal end of frontal ridge distinctly separated from the fastigium by a transverse groove; vertex with a weak longitudinal groove (Figure 593). Wings in the ♂ with a weak narrow dark band. Hind femora dark blue inside but the ventral marginal part in the distal half is red, all the ventral aspect straw-yellow, hind tibiae *inside near the base red, later blue, again red in the distal* third. Length ♂ 27, ♀ 31-46 mm, tegmina ♂ 11, ♀ 7.0-10.5 mm. — China *desert of Ala Shan and the Ala Shan Range in Ningsia Province,* eastern Nan Shan in Kansu Province (Figures 590, 641) . . . . 1. P. alashanicus B.-Bienko

Bei-Bienko, 1948 6, Figures 2, 6-8.

84. Genus Mongolotmethis B.-Bienko

Bei-Bienko, 1948 8, 13.

Type of genus M. gobiensis B.-Bienko

Like Filchnerella Karny and Pseudotmethis B.-Bienko, but differing by the following characters: vertex (Figure 594) hardly depressed, nearly flat, in the ♂ without granules, *with transverse wrinkling, fastigium* anteriorly only slightly cut by the groove of the frontal ridge, preocellar and superocellar foveolae absent, or in the ♀ the latter only slightly emphasized, supplementary facial carinae weak, usual in type Pronotum (Figure 591) with faint sparse tubercles, the premarginal processes in the metazona and on the lateral lobes short, in the form of broadly conical tubercles, posterior margin of metazona with roundly convex margins. ♂ tegmina fusiform strongly narrowed apicad, ♂ wings narrower than in *Filchnerella Karny*, the 2 longitudinal veins of the second wing-lobe ($2A_1$ and $2A_2$) slightly curved, nearly parallel for all their length. Hind tibiae normally without outer apical spine, they are red only in the distal fourth. Abdomen dorsally, especially in the ♂, without distinct tubercles at the posterior margin of the segments or in the ♀ with only slight tubercles which are raised only dorsally,

The absence of the outer apical spine on the hind tibiae is especially characteristic of this genus, *individuals having this spine are found only* occasionally.

Two species in all are known from the Mongolian People's Republic, one of them is subdivided into 2 subspecies.

1(2). Smaller, body without distinct light spots. Frontal ridge under the ocellus slightly notched, in the ventral part not at all projecting

(Figure 591). Median carina of pronotum cut by 3 transverse grooves, in the prozona higher than in the metazona, and well separated by the posterior, transverse groove (Figure 591). The greatest width of the tegmen in the ♂ is before its middle. ♂ wings with a slight, narrow, slightly interrupted band which is narrowed and gradually becomes weaker behind (Figure 594). . . . . 1. M. gobiensis B.-Bienko.

a(b). ♂ tegmina nearly reaching the supraanal plate. Hind femora dark blue
321 inside, with orange-red ventral margin and ventral genicular lobe, the distal part light; ventral aspect with a narrow reddish edge along the inner margin. Hind tibiae dark blue inside except the red basal part and the apical fourth. Length ♂ 26.0-30.5, ♀ 34-47 mm; tegmina ♂ 14.5-15.5, ♀ 8-10 mm. —Mongolia: western part of the Gobi Desert . . . . 1a. M. gobiensis gobiensis B.-Bienko.

Bei-Bienko, 1948:9, Figure 3.

b(a). ♂ tegmina hardly reaching the middle of the abdomen. Color of hind legs as in the preceding. Length ♂ 31.0-32.5, tegmina 11 mm; ♀ unknown. —Mongolia: northern Gobi, including the Gobi part of Altai Mountains . . . . 1b. M. gobiensis pedestris B.-Bienko.

Bei-Bienko, 1948:10.

2 (1). Larger, more rugose, coloring variegated. Frontal ridge with a strong, in the ♂ nearly right-angled emargination below the ocellus and roundly projecting ventral part. Median carina of the pronotum only narrowly cut by the posterior transverse groove, making almost a joint arc on the whole extent, not higher in the prozona than in the metazona. Greatest width of tegmina in the ♂ is in the middle. ♂ wings with a sharper dark band which is widened out in the posterior part. Color of hind legs as in the preceding species. Length ♂ 35.0-38.5, ♀ 48-55 mm; tegmina ♂ 14-16, ♀ 8.0-9.5 mm. —Mongolia: central part. . . . . 2. M. kozlovi B.-Bienko.

Bei-Bienko, 1948:10.

85. Genus Eotmethis B.-Bienko

Bei-Bienko, 1948:11, 14.

Close to Rhinotmethis Sjost. Head (Figure 595) with a strong nearly right-angled incision on the frontal ridge below the ocellus; dorsal part of ridge strongly projecting forward and making a straight, greatly sloping line with the vertex; the length of this process is less than the diameter of the eye; its lateral aspects bear a strong oblique ridge situated between the margin of the eye and the ventral margin of the antennal sockets and

parallel to the dorsal margin of the frontal ridge; median ocellus situated on the sloping ventral surface of the process of the frontal ridge, turned obliquely ventrad but still visible when the head is examined from the front, preocellar and superocellar foveolae indistinct (in the ♂) or slightly marked (in the ♀). Antennae in the ♀ a little shorter than the head and pronotum combined. Pronotum (Figure 595) with a series of long narrowly conical spine-like processes before the posterior margin of the metazona, including the lateral lobes, median carina high, strongly arcuately raised in the metazona. Prosternum anteriorly with a plate-like process divided into two acute-angular lobes. ♂ tegmina hardly shorter than the abdomen, narrowly oval, hardly narrowed toward the apex, in the ♀ strongly abbreviated, lateral. Wings in the ♂ wide, yellow at the base, with a sharp dark band, $2A_1$ and $2A_2$ moderately curved, nearly parallel to each other. Abdomen dorsally with strong teeth which are turned backwards at the posterior margin of the tergites, making in the ♂ 1, in the ♀ 3 longitudinal rows. Hind tibiae with outer apical spine, at the base to the spines and in the distal third red, the remaining part dark blue.

One species is known.

322 1(1). Vertex strongly concave with sharp high lateral carinae, posterior oblique carinae distinct. Pronotum densely covered with conical tubercles. Hind femora on the outside along the dorsal margin with many conical tubercles, on the inside to the dorsal carina dark blue, in the distal third ventrally bright raspberry-red, dorsally pale yellow, inner spines of hind tibiae reddish on the inside. Length ♂ 21-25, ♀ 30.0-33 5, tegmina ♂ 10.0-11.3, ♀ 6.5-8.0 mm —China eastern part of Kansu Province (Figures 595, 639) . . . . 1. E. nasutus B.-Bienko.

Bei-Bienko, 1948 11, Figures 4, 9.

86. Genus Rhinotmethis Sjostedt

Sjostedt, 1933, Ark Zool , 25A(3) 29, Uvarov, 1943b 68 Bei Bienko, 1948:13

Close to Eotmethis B.-Bienko and differing by the stronger process of the frontal ridge (Figure 596) —in the ♂ its length is more than the diameter of the eye, ocellus situated right on the ventral surface of the process and not visible from the front, lateral aspects of the process normal, without a strong ridge. The process of the prosternum is completely plate-like, sometimes with a weak notch, ♀ antennae short, hardly longer than half the combined length of head and pronotum. Hind tibiae red at the base up to the spines and in the distal fourth.

Only one species is known

1(1). Not large. Hind femora on the inside dark blue only between the inner carinae; dorsal part of inner surface pale yellow, ventral part red, distal third pale yellow, with a red spot on the ventral genicular lobe. ♂ tegmina reaching the supraanal plate. Length ♂ 22, ♀ 33-40 mm, tegmina ♂ 10, ♀ 8.0-9.5 mm. —Mongolia southeastern part (station of Ude on the Kalgan highway), China Inner Mongolia to Ordos in the south

(Figure 596). . . . . 1. Rh. hummeli Sjöst.

Sjostedt, 1933, Ark. Zool., 25A(3) 29, tab. 11, Figure 7, 8, tab. 12, Figures 1, 2; Uvarov, 1943b 68; Bei-Bienko, 1948:12.

87. Genus Thrinchus F.-W.

Fischer-Waldheim, 1833, Byulleten' Moskovskogo obshchestva ispytatelei prirody, VI-363, 1846-255 (partly); Jakobson, 1905-278, Uvarov, 1927a-146, 1943b 69.—Thrincus Saussure, 1884:219.

Type of genus: Th. campanulatus F.-W.

323 Average size or large, rather slender; slightly rugose, with sparse hairs (Figure 647). Antennae long. The height of the head (counting from the ventral margin of the front) equal to its own width or more; vertex depressed with raised lateral margins, rather narrow, even in the ♀ hardly wider than the diameter of the eye, anteriorly projecting roundly or at an angle, the foveolae absent or only the carina-like ventral margins of the super-ocellar pits are marked; frontal ridge narrow, very greatly projecting forward between the antennal bases, sharply depressed under the ocellus (Figures 598, 644-646), sometimes obliterated. Pronotum (Figures 598, 644-646) saddle-shaped, in the prozona strongly narrowed and without acute-angular process in the middle of the anterior margin, in the metazona wide, flat; median carina in the prozona slightly or considerably raised, often bi- or tri-dentate, in the metazona low, linear; posterior margin of metazona right- or acute-angular; lateral lobes with a right or nearly right antero-ventral angle. Prosternum not swollen in the middle, only slightly convex in the anterior part; anterior margin slightly or rather strongly raised in the form of a platelet; sometimes emarginate or dentate; transverse groove of mesothorax in the middle strongly projecting caudad. Tegmina and wings long, almost or entirely reaching the apex of the hind tibiae; length of tegmina 5-6.5 times more than its width; wings stained yellowish-green or dark bluish near the base, with a dark band in the middle reaching the postero-inner margin of the wing, apical part light, transparent, $2A_2$ slightly curved, sometimes almost straight. Anterior and middle legs long, slender; hind femurs with the usual, straight dorsal and ventral carinas; the dorsal carina with sloping spinules; hind tibiae on the outside with 9 (sometimes 8 or 10-11) on the inside with 8 larger and [more] curved spines; outer and inner apical spines absent (Figure 576); spurs normal or moderately long. Tympanic lobe large, transversely rectangular, covering about 1/3 of the tympanic organ; Krause's organ well developed, transversely rugose. Epiphallus with 2 elongate rows of spines, posteriorly with a long, apically rounded lobe (as in Figure 24, b).

The genus Thrinchus F.-W. was described by Fischer-Waldheim (1833) from a single species, T. campanulatus F.-W., erroneously described from "Georgia". Later on this same author (1846) described an entire series of species of this genus but only one, Th. schrenkii F.-W. from Dzungaria, turned out to be an actual representative of the genus Thrinchus F.-W. Both the species in question were inadequately described and recent authors have referred absolutely different species to them. An interpretation of these species, and descriptions of 5 additional species, including 3 new ones, are given below.

All 7 species are restricted in distribution to Middle Asia with one species extending into Chinese Dzungaria. Within the limits of the genus are found 2 life forms connected by transitions: (a) inhabitants of clay-gravel and rocky localities, having a more compact [or stocky, thickset] body and darker coloring, with unicolored pronotum and normal spurs on the hind tibiae, i. e., species appearing to be the usual geophiles of open spaces and (b) more specialized inhabitants of sandy deserts, or psammobionts [i. e., sand-dwellers], having a slender body, characteristic coloring of the pronotum (with a white basal background and dark longitudinal bands especially along the median carina of the metazona), and often with elongated spurs
324 on the hind tibiae. The species of this last group have markings [or features] similar to the genus Strumiger Zub.

1 (12). Spurs of hind tibiae normal, not extending beyond the middle of the first segment of the hind tarsi or slightly elongated and reaching the base of the preapical pulvillus (Figure 642); in the latter case the median carina of the pronotum in the prozona is strongly raised, with a perpendicular posterior margin (Figure 645).

2 (7). Body darker, often with unicolored pronotum; tegmina without a light band in the costal and cubital fields. Median carina of pronotum in the prozona usually low, sometimes tuberculose, or the posterior margin is strongly sloping (Figure 598). Prosternum with slightly or moderately raised anterior margin. Posterior tibiae on the inside often bright red.

325 3 (4). Wings near the base greenish or greenish-yellow. Frontal ridge in profile moderately projecting forward between the bases of the antennae; notch below the ocellus very blunt (Figure 598). . . . . *1. Th. campanulatus F.-W.

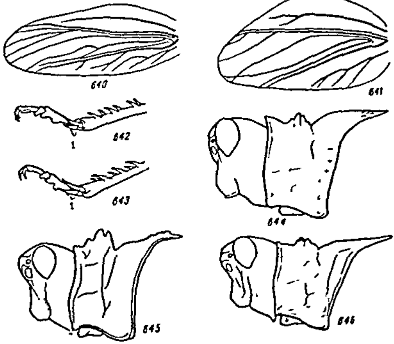
a (b). Anterior margin of prosternum only slightly and uniformly raised for all its extent. Transverse groove between the lobes of the mesosternum in the ♀ considerably, in the ♂ hardly, longer than the width of each lobe. Wings greenish-yellow near the base. Length ♂ 32-35, ♀ 44-48 mm; tegmina ♂ 29.5-33.5, ♀ 39-43 mm. —Uzbekistan desert north of the Buchara-Kermine line, probably its distribution is considerably wider. (Figure 642). . . . . *1a. Th. campanulatus campanulatus F.-W.

Fischer-Waldheim, 1833, (cited publications) 375, 1846 257, tab XI, Figure 1.

b (a). Anterior margin of prosternum perceptibly raised in the form of a platelet, usually with a notch in the middle. Transverse groove between the lobes of the mesosternum not longer or only in the ♀ sometimes a little longer than the width of each lobe Wings greenish near the base. Length ♂ 28-33, ♀ 38-45 mm, tegmina ♂ 28-31, ♀ 36-43 mm —Uzbekistan· Fergana valley, Kirghizia, Tokmak on the Chu River (!), Kazakhstan· Dzharkent [Panfilov] (!) . . . . *1b. Th. campanulatus variegatus Tarb.

Tarbinskii, 1926, Ann. Mag. Nat. Hist., (9) XVII 89, Figure 3, Uvarov, 1927a 148, Figure 170, 1943b 69.

4 (3). Wings near the base blue or bluish to dark blue.



Figures 640-646
(Figures 640 and 641 according to Bei-Bienko, the rest original)

640—*Filchnerella kukunoris* B.-Bienko, ♂, left tegmen (type), 641—*Pseudotmethis alashanicus* B.-Bienko, ♂, ibid. (paratype), 642—*Thrinchus campanulatus* F.-W., ♀, inner aspect of the apex of left hind tibia, and tarsus (1—inner pair of spurs), 643—*Th. desertus* B.-Bienko sp. n., ♀, ibid. (1—inner pair of spurs), 644—*Th. turcmenus* sp. n., ♀, head and pronotum from the side (paratype); 645—*Th. arenosus* B.-Bienko, ♀, ibid. (Ili River near Bakanas), 646—*Th. desertus* B.-Bienko sp. n., ♀, ibid. (paratype, Kzyl-Orda).

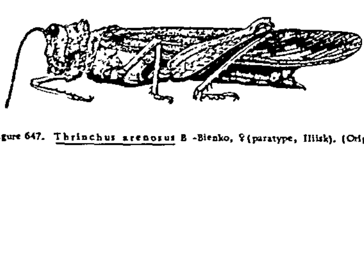


Figure 647. *Thrinchus arenosus* B.-Bienko, ♀ (paratype, Iliisk). (Original)

5 (6). Anterior margin of pronotum not thickened and without a raised process at the beginning of the median carina. Dark band of wings wider, in the middle only 2-2.5 the distance from its inner margin to the base of the wing. Pronotum sometimes with a trace of a dark band along the median carina in the metazona. Length ♂ 28-34, ♀ 36-50 mm; tegmina ♂ 28-36, ♀ 37-47 mm. —Kazakhstan northern border of the Kara Tau ridge, Betpakdala desert, Balkhash littoral ('); West China: Dzungaria Tolerates [or clings to] rocky deserts . . . . *2. Th schrenkii F.-W.

Fischer-Waldheim, 1846 259, tab. XXVII, Figure 1, Bei-Bienko, 1948 14, Figure 10.

6 (5). Anterior margin of pronotum thickened and distinctly raised at the beginning of the median carina in the form of an obtuse-angular process, as a result of which the median carina of the prozona in profile has a strong depression or notch in the middle (Figure 644). The dark band of the wings not very wide, in the middle it is nearly 1/3 of the distance from its inner margin to the base of the wing. Pronotum unicolored. Length ♂ 27-32, ♀ 42-48 mm, tegmina ♂ 25-33, ♀ 37-44 mm. — Turkmenia from Krasnovodsk (type ♂) to Dzhebel and Uzun-ada in the south . . . . *3. Th turcmenus B.-Bienko sp. n.

7 (2). Body lighter, pronotum in the metazona with a dark band along the median carina, tegmina usually with a well-marked light band in the costal and cubital fields. Pronotum in the prozona with a high median carina, the posterior margin of which is entirely or almost perpendicular (Figure 645) Anterior margin of prosternum stronly lamellately raised, or low Hind tibiae sometimes yellow.

326 8(11) Median carina of pronotum in prozona gradually raised from the anterior to the posterior margin, its dorsal margin in profile straight or only slightly emarginate, often tridentate (Figure 645) Anterior margin of pronotum at the beginning of the median carina, without a process. Transverse groove between the lateral lobes of mesosternum located before their middle.

9(10). Anterior margin of prosternum only slightly raised, not projecting in the form of a platelet. Spurs of hind tibiae short, the inner pair reaches only to the middle of the first segment of the hind tarsi Wings dark blue near the base, with a wide dark band (as in T schrenkii). Length of pronotum 1.1-1.2 times more than its greatest width, metazona with a right angled posterior margin. Length ♂ 30-34, ♀ 43-50 mm, tegmina ♂ 33-35, ♀ 42-48 mm —Southwestern Kazakhstan, Malye Barsuki sands (Koilibai, type ♂), Karakum near the Aral Sea, lower course of the Syr Darya Clings to sands . . . . *4. Th. aralensis B.-Bienko sp n

10 (9) Anterior margin of prosternum distinctly raised like a platelet. Spurs of hind tibiae more elongate, inner pair reaching the base of the middle pulvillus of the first tarsal segment. Wings basally greenish-blue or bluish Clings to sands . . . . *5. Th. arenosus B.-Bienko.

a (b). Pronotum longer and narrower, its length not less than 1.3-1.5 times more than the greatest width at the shoulders. Posterior margin of metazona of pronotum projecting in the form of an acute angle Wings

basally greenish-blue. Length of ♂ 28-31, ♀ 37-42 mm; tegmina ♂ 28.0-30.5, ♀ 34.5-41.0 mm. —Kazakhstan: sands of eastern Balkash Region from the Lepsa River in the north to the Ili in the south, sands of Muyun-Kum (Akyr-tyube (!)) (Figures 645, 647) . . . . *5a. Th. arenosus arenosus B.-Bienko.

Bei-Bienko, 1948, Izvestiya AN Kazakhskoi SSR, seriya zoologicheskaya, 8.192, Figure 3.

b (a). Pronotum shorter; its length 1.1-1.2 times more than the greatest width at the shoulders. Posterior margin of metazona right-angled. Wings basally dark bluish, without a greenish tinge. Length ♂ 31.0-32.5, ♀ 41-45 mm; tegmina ♂ 32.5-35.0, ♀ 41.5-45.0 mm. —Kazakhstan: Along the Ili, Karakum (southward from Dzharkent: hamlet of Kunduzdy) . . . *5b. Th. arenosus extimus B.-Bienko subsp. n.

11 (8). Median carina of pronotum distinctly raised only in the posterior part of prozona and less strongly at its anterior margin, as a result of which the middle is distinctly depressed or notched. Anterior
327 margin of pronotum at the beginning of the median carina, with a raised process. The transverse groove of mesosternum is situated in the middle between the lateral lobes. Prosternum with strongly lamellately-raised anterior margin. Body slender with a long narrow pronotum. Wings slightly bluish at the base, the dark band in the ♀ 1.5-2.0 mm short of reaching the posterior margin. Length of ♂ 26-29, ♀ 39-42 mm; tegmina ♂ 22.5-27.0, ♀ 34-41 mm. —Tadzhikistan: Kabadian; southern Uzbekistan: Termez (!); eastern Turkmenia; Kelif (!). . . . . *6. Th. tuberculosus Tarb.

Tarbinskii, 1926, Ann. Mag. Nat. Hist., (9), XVII.88, Figures 1, 2, Uvarov, 1927a:149; Figures 171, 172; 1943b 69.

12 (1). Spurs of hind tibiae long, extending considerably beyond the middle of the first segment of the hind tarsus, nearly reaching the end of the preapical pulvillus (Figure 643). Median carina of pronotum very low, only slightly raised in the posterior part of the prozona in the form of 2 or 3 tubercles (Figure 646). Tegmina and wings long and narrow; tegmina 6-6.5 times longer than the width of a tegmen; wings with a narrow dark band which strongly narrows at the posterior margin, sometimes cut by light veins into several parts; posterior margin with undarkened border 1.0-1.5 mm wide. Length of ♂ 32-35, ♀ 42-46 mm; tegmina ♂ 31-34, ♀ 42-48 mm. —Middle Asia: deserts of Kyzyl-kum from Kzyl-Orda in the North to 40° North latitude in the south (Cossack village of Kzyl-tepe, ♂ type), delta of the Amu Darya. Sandy wastes. . . . . *7. Th. desertus B.-Bienko sp. n.

88. Genus Strumiger Zub.

Zubovskii, 1896, Trudy Russkogo entomologicheskogo obshchestva, XXX:188; Jakobson, 1905:279, Uvarov, 1927a-149, 1943b 70.

Like Thrinchus F.-W., but the pronotum has a strong sharp process in the middle of the anterior margin — the process being turned forward and upward, antero-ventral angle of lateral lobes more drawn out ventrad and partly forward, acute (Figure 599); prosternum in the middle swollen, from the anterior to the posterior margins, the anterior margin strongly raised in the form of a platelet and covering the mouth from below; transverse groove of mesosternum in the middle projecting caudad still more strongly and situated here between the mid-points of the lateral lobes or even deeper, spurs on hind tibias long; the inner ventral spur nearly equal in length to the first segment of the hind tarsi.

This genus is a specialized derivative of the genus Thrinchus F.-W. and shows a conspicuous closeness to such species as T. arenosus B.-B., T. desertus B.-B., T. tuberculosus Tar. and others. Similar to most (if not all) of these species, the genus Strumiger Zub. has also been connected with sandy habitats, being an example of a sharply defined psammobiont

Only one species is known — St desertorum Zub., which has been subdivided into 3 weakly delimited subspecies which are represented by transitional forms in the intervening parts of their ranges.

a (b). Median carina of pronotum in the posterior part of prozona not at all raised or barely raised in the form of very slight tubercles (Figure
328 599). Length ♂ 22-28, ♀ 31-36, tegmina ♂ 21-25, ♀ 28-34 mm. — Turkmenia· from the Caspian Sea to the Amu Darya, except the southeastern borders, the most typical form is found in the part along the Caspian Sea, and on the remaining territory there are often transitions to other subspecies of the form (Figure 24, b) . . . . *1a S [t] desertorum desertorum Zub.

Zubovskii, 1896, cited publications 189 Jakobson, 1905 279 Uvarov, 1927a 150 Figures 123, 179.

b (a). Median carina of pronotum in the posterior part of prozona distinctly raised in the form of well-marked tubercles.

c (d). Spurs of hind tibiae long, inner ventral spur nearly equal to the first segment of the hind tarsus or at least reaching the base of the distal pulvillus. Dimensions as in the preceding subspeceis. —Kazakhstan: Kyzyl-kum north to Dzhulek (type ♂), Uzbekistan Golodnaya steppe, southern border of the Kzyl-kum and farther south to the Amu Darya, Turkmenia· southeastern part . . . . *1b. St. desertorum calcaratum B.-Bienko subsp. n.

d (c). Spurs of hind tibia shorter, reaching only the base of the preapical pulvillus of the hind tarsus. Dimensions as in the preceding subspecies. —South Turkmenia Ashkhabad (transitional to the basic subspecies of the form). Eastern Iran (Khorasan, Kerman), northern Afghanistan . . . . *1c. St. desertorum persa Uv.

Uvarov, 1933, Trudy Zoologicheskogo Instituta AN SSSR, (1932), I 211.

89. Genus Haplotropis Sauss.

Saussure, 1888:125.—Haplootropis Jakobson, 1905:170, 194, 280.—Staurotylus Adelung, 1910, Hor. Soc. Ent. Ross., XXXIX:343.

No preocellar foveolae. Fastigium bordered by a ridge. Median carina of pronotum not intersected by a transverse groove, convex. Tegmina lateral, greatly abbreviated. Wings hardly perceptible. Middle tibiae in the ♂ without tubercles along the dorsal margin.

Only 1 species is known, inhabiting southeastern Siberia and North China.

1(1). Fastigium with transverse rugulae. Pronotum with sharp rugae and tubercles. Tegmina parabolic, hardly extending beyond the first abdominal tergite. Hind tibiae blue, Length of ♂ 28-37, ♀ 34.5-49.0 mm; tegmina ♂ 6.0-7.5, ♀ 5.5-8.0 mm;—Southeastern Siberia from Transbaikalia to the Maritime Territory; North China. . . . .*1. H. brunneriana Sauss.

Saussure, 1888:125, tab. 2, Figure 10, Jakobson, 1905:194, 280 (Haplootropis).—mandshuricus Adelung, 1910, Hor. Soc. Ent. Ross., XXXIX:344 (Staurotylus).

90. Genus Tropidauchen Sauss.

Saussure, 1887, Spicilegia Entomologica genavensis. 2. Tribu des Pamphagiens: 19, 72 (partly), Jakobson, 1905:172, 199, 293 (partly); Uvarov, 1927a:160 (partly).

Type of genus: Tropidauchen securicolle Sauss.

Frontal ridge in profile rounded, but without a notch right under the med-
329 ian ocellus. Vertex in profile nearly vertical; its fastigium is bordered by a ridge. No preocellar foveolae. Median carina of pronotum arcuate, not intersected by a transverse groove. Tegmina and wings absent. Middle tibiae in the ♂ without tubercles along the dorsal margin. Hind femora slightly narrowed toward the distal end; dorsal lobe of femur reaching its distal end, hardly narrowed toward it; dorsal margin with distinct large pointed spines; ventral lobe slightly narrowed toward the distal end of the femur; its width before the genu is 1/2-2/3 the greatest width of the ventral genicular lobe. Prosternum with a sharp median process. First abdominal tergite with a large tympanic organ.

Seven species, distributed in Syria and Iran, are known.

1(4). Prosternal process in profile with 2 cusps on the apex (Figure 649). Mesosternum of with anterior margin greatly roundly projecting forward; in side view it reaches the base of the prosternal process (Figures 650, 651).

300 2(3). ♂ vertex very wide; its greatest width nearly equal to its length (Figure 652). ♂ mesosternum without a pad in the middle of the median process of the anterior margin (Figure 651). *♀ unknown. Length of* ♂ 39.4 mm, of hind femur 20.7 mm. —Western Iran: Kurdistan. (Figure 648a) . . . . 1. T. viridis B.-Bienko.

Bei-Bienko, 1950, Doklady AN SSSR, (novaya seriya), LXXIII-5:1091, Figure 2.

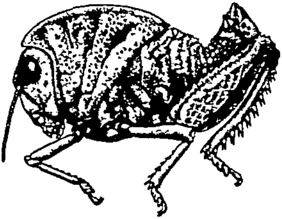


Figure 648. Tropidauchen cristatum Mistsh., ♂ (paratype). (Original)

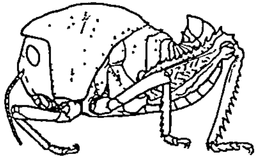
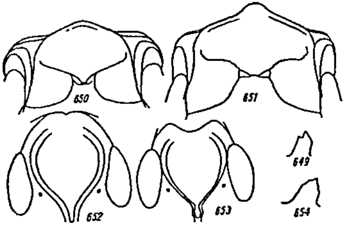


Figure 648a. Tropidauchen viridis B.-Bienko, ♂. (According to Bei-Bienko)



Figures 649-654
(Original)

649—Tropidauchen serratum Mistsh., ♂, prothoracic process from the side (type), 650—T. serratum Mistsh, ♂, mesothorax from below (type), 651—T. viridis B.-Bienko, ♂, ibid. (type), 652—T. viridis B.-Bienko, ♂, vertex, front view (type), 653—T. serratum Mistsh., ♂, ibid. (type), 654—T. cristatum Mistsh., ♂, prothoracic process from the side (type).

3(2). ♂ vertex narrower; its greatest width nearly 2/3 its length (Figure 653). Mesosternum of ♂ with broadly rounded anterior margin and in the middle with a distinct pad close to it (Figure 650). ♀ unknown. Length of ♂ 34.6, of hind femur 18.3 mm. —Northern Iran: Asterabad . . . . 2. T. serratum Mistsh.

Mishchenko, 1951, Doklady AN SSSR, (novaya seriya), LXXVII, 4:737, Figure 1[1].

4(1). Prosternal process in both sexes, in profile, with a wide apex, which has one cusp near the anterior margin (Figure 654). ♂ mesosternum with anterior margin slightly projecting forward; in side view it does not reach the base of the prosternal process (Figures 655, 656).

5(8). Hind tibiae in both sexes with whitish or yellow inner aspect. Mesosternum in both sexes with moderately wide space between the lobes; its median width is equal to or considerably greater than the narrowest part of the mesosternal lobe (Figures 655, 656).

6(7). Vertex in both sexes wide; its greatest width 1.25 times greater than
331 its length (Figure 657). Mesosternum in both sexes with a pad near the anterior margin which reaches its lateral lobes (Figure 655). ♂ cerci long; length of one of them twice more than its greatest width (Figure 658). ♂ subgenital plate with distinctly notched apex (Figure 659). Length of ♂ 39.5-47.8, ♀ 71.6-76.9 mm; of hind femur ♂ 17.7-19.2, ♀ 22.3-23.4 mm. —Western Iran: Faragan (village of Malyat-abad) (Figure 648) . . . . 3. T. cristatum Mistsh.

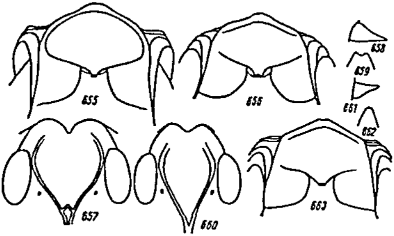
Mishchenko, 1951, Doklady AN SSSR, (Novaya seriya), LXXVII, 4:737, Figure 1[2].

7(6). Vertex of ♂ narrower; its greatest width 1.75 times greater than its length (Figure 660). Mesosternum of ♂ with a pad near the anterior margin which is far from reaching its lateral lobes (Figure 656). ♂ cerci shorter, the length of one of them 1.75 times greater than its greatest width (Figure 661). Subgenital plate of ♂ with a pointed apex (Figure 662). ♀ unknown. Length of ♂ 38.8-40.4, of hind femur 17.5-18.6 mm. —Northern Iran: Semnan . . . . 4. T. flavipes Mistsh.

Mishchenko, 1951, Doklady AN SSSR, (novaya seriya), LXXVII, 4:738, Figure 1[3].

8(5). Hind tibiae in the ♂ with orange inner aspect. Mesosternum in the ♂ with a narrow space between the lobes; its median width is considerably less than the narrowest part of the mesosternal lobe (Figure 663). ♀ unknown. Length of ♂ 37.3-42.7, of hind femur 17.2-18.6 mm. —Western Iran: Faragan, Semnan. . . . . 5. T. predtetshenskii Mistsh.

Mishchenko, 1951, Doklady AN SSSR, (novaya seriya), LXXVII, 4:738, Figure 1[4].



Figures 655-663
(Original)

655—Tropidauchen cristatum Mistsh., ♂, mesothorax from below (type). 656—T. flavipes Mistsh., ♂, ibid. (type). 657—T. cristatum Mistsh., ♂, vertex, front view (type). 658—T. cristatum Mistsh., ♂, left cercus from the side (type). 659—T. cristatum Mistsh., ♂, apex of genital plate from behind (type). 660—T. flavipes Mistsh., ♂, vertex, front view (type). 661—T. flavipes Mistsh., ♂, left cercus from the side (type). 662—T. flavipes Mistsh., ♂, apex of genital plate from behind (type). 663—T. predtetshenskii Mistsh., ♂, mesothorax from below (type).

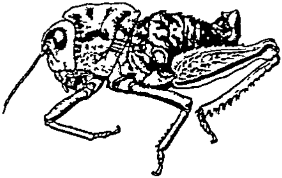


Figure 664. Saxetania spinosa Mistsh., ♂ (paratype)
(Original)

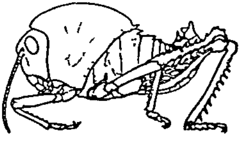


Figure 664a. Saxetania alexandrovi (B.-Bienko), ♂ (According to Bei-Bienko)

91. Genus Saxetania Mistsh.

Mishchenko, 1951, Doklady AN SSSR, (novaya seriya), LXXVII, 4:738. —Tropidauchen Saussure, 1887, Spicilegia Entomologica genavensis. 2. Tribu des Pamphagiens:19, 72 (partly), Jakobson, 1905:172, 199, 293 (partim); Uvarov, 1927a·160 (partim).

Type of genus: Saxetania decumana Mistsh.

Frontal ridge in profile with a distinct notch right under the median ocellus; the dorsal part distinctly projecting forward. Vertex in profile moderately sloping; its fastigium bordered by a ridge. No preocellar foveolae. Median carina of pronotum arcuate, not intersected by a transverse groove. No tegmina or wings. Median tibiae of the ♂ without tubercles along the dorsal margin. Hind femur strongly narrowed apicad; dorsal lobe of femur not reaching its distal end, strongly narrowed toward it; dorsal margin with large distinct pointed spines; ventral lobe strongly narrowed toward the distal end of the femur; its width near the genu is 1/4-1/3 the greatest width of the ventral genicular lobe. Prosternum with a sharp median process. First abdominal tergite with a large tympanic organ.

There are 16 species, distributed in Iran, southern Middle Asia, and northern Afghanistan.

333 1 (8). Prosternal process conical or pyramidal, laterally compressed, but always with sharpened apex (Figures 665, 666).

2 (7). Hind femur in both sexes with sharp teeth in the distal part of the dorsal carina (Figures 668, 669).

3 (4). Vertex in both sexes moderately depressed, its margins smoothed over. Hind femur in both sexes with several sharp teeth along the ventral margin of the outer aspect (Figure 667). Hind tibia in both sexes with almost black inner aspect. Prosternal process in both sexes conical (Figure 665). Length of ♂ 24.6, ♀ 36.2-48.0 mm; of hind femur ♂ 11.7, ♀ 17.6-20.0 mm. —Northern Iran: Kermanbalk .... 1. S. sabulosa (Uv.)

—sabulosum Uvarov, 1923, Journ. Bomb. Nat. Hist. Soc., XXIX:649, tab. I, Figure 1 (Tropidauchen), Uvarov, 1927a.161, 162, Figure 197 (Tropidauchen).

4 (3). Vertex in both sexes strongly depressed, its margins sharp. Hind femora in both sexes usually with a sinuous ventral margin on the outer aspect (Figure 668), rarely with 1 to 2 obliterated teeth in the apical part, along that margin. Hind tibia in both sexes with a violet inner aspect. Prosternal process pyramidal, laterally compressed (Figure 666).

5 (6). Hind femora in both sexes slender; length of femur 3.6-3.8 times more than its widest part (Figure 669). Mesosternal lobes in both sexes wide; the greatest width of the lobe is equal to its length (Figure 670).
334 Length of ♂ 33.4-34.0, ♀ 53.0-57.5 mm; of hind femur ♂ 18.0-18.8, ♀ 22.0-24.6 mm. —Western Iran: Gotvend. 2. S. escalerai (I. Bol.)

I. Bolivar, 1912:4, 11 (Tropidauchen).

6 (5). Hind femora in the ♂ stouter, length of femur 3 times more than its greatest width (Figure 668). Mesothoracic lobes in the ♂ narrow; the

greatest width of a lobe is less than its length (Figure 671). ♀ unknown. Length of ♂ 31.4, of hind femur 15.6 mm. —Iran (Figure 664 a). . . . . 3. S. alexandrovi (B.-Bienko).

Bei-Bienko, 1950, Doklady AN SSSR, (novaya seriya), LXXIII, 5 1091, Figure 3 (Tropidauchen).

7 (2). Hind femur in the ♀ without teeth in the distal part of the dorsal carina (Figure 672). Vertex in the ♀ strongly depressed. Hind tibiae in the ♀ with a violet inner aspect. Prosternal process in the ♀ pyramidal. ♂ unknown. Length of ♀ 41.2-45.0, of hind femur 17.3-18.6 mm. —Northern Iran Shaku . . . . .4. S. elbursiana (Rme).

—elbursianum Ramme, 1929, Eos, V 158, Figures 9a-b, tab. V, Figure 4 (Tropidauchen)

335 8 (1). Prosternal process wedge-shaped, with flat or with weakly notched apex (Figure 673), sometimes the apex has 2 notches (Figure 674) or is distinctly bifurcate (Figure 675).

9 (30). Mesosternal lobes in both sexes wide, the greatest width of a lobe is equal to or more than its length (Figures 676, 677), sometimes hardly less than this length, then the body has distinct pointed tubercles.

10 (25). Prosternal process with flat or slightly notched apex (Figure 673), but sometimes with 2 notches on the apex (Figure 674).

11 (12). Pronotum in both sexes with indistinct blunt tubercles. Vertex in both sexes strongly depressed. Hind femora in both sexes with a sinuous ventral margins. Hind tibia in both sexes with a dark blue, a brown, or a black inner aspect. *5. S. paramonovi (Dirsh).

a (b). Hind tibia in the ♀ with a blue inner aspect. ♂ unknown. Length of ♀ 47.0-53.8, hind femur 19.0-21.3 mm. —Kopet Dag Firyuza, Kheirabad. . . . . *5a. S. paramonovi paramonovi (Dirsh).

—paramonovi Dirsh, 1927, Bol. R Soc. Esp. Hist. Nat., XXVII 296, Figure 1 (Tropidauchen), Uvarov, 1927a 161, 162, Figure 197a (Tropidauchen).

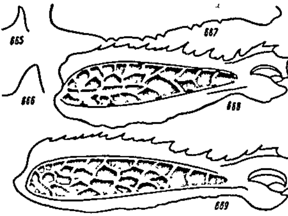
b (a). Hind tibia in both sexes with a black or brown apical part on the inner aspect. Length ♂ 21.1, ♀ 42.3-53.7 mm, hind femur ♂ 11.6, ♀ 17.5-20.6 mm. —Kopet Dag· Mount-Shakh-shakh . . . . *5b. S. paramonovi fuscipes Mistsh.

Mishchenko, 1951, Doklady AN SSSR, (novaya seriya), LXXVII, 4 739, Figure 1[5]

12 (11). Pronotum in both sexes with distinct pointed tubercles.

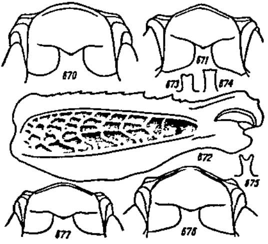
13 (24). Hind tibia in both sexes with a blue or a violet inner aspect, which is almost colorless in the ♀ Median carina of pronotum [in the ♀] straight in the middle part. Mesothorax of ♂ with moderately wide lobes, greatest width of a lobe equal to or hardly less than its length (Figure 676).

14 (23). Prosternal process in both sexes with a flat or slightly notched apex (Figure 673).



Figures 665-669
(Original)

665—*Saxetania sabulosa* (Uv.), ♀, prosternal process from the side; 666—*S. escalerai* (I. Bol.), ♀, ibid.; 667—*S. sabulosa* (Uv.), ♀, ventral margin of left hind femur from the side; 668—*S. alexandrovi* (B.-Bienko), ♂, left hind femur from the side (type), 669—*S. escalerai* (I. Bol.), ♂, ibid.



Figures 670-677
(Original)

670—*Saxetania escalerai* (I. Bol.), ♂, mesothorax from below, 671—*S. alexandrovi* B.-Bienko, ♂, ibid. (type), 672—*S. elbursiana* (Rme.), ♀, left hind femur from the side, 673—*S. cultricollis cultricollis* (Sauss.), ♂, prosternal process, front view; 674—*S. scutata* Mistsh., ♂, ibid. (type), 675—*S. spinosa* Mistsh., ♂, ibid. (type); 676—*S. muricata femoralis* Mistsh., ♂, mesothorax from below (type) 677—*S. uvarovi* (Mistsh.), ♂, ibid. (paratype).

15(18). Vertex in both sexes *nearly smooth in the anterior part, with* single, strongly smoothed out tubercles, in the ♂ slightly depressed, with a weak median carina in the posterior part, in the ♀ elongated (Figure 678).

16(17). *Pronotum of the ♀ in profile with nearly straight median carina* (Figure 679). *Subgenital plate in the with arcuate posterior margin*, which is without a median rounded process (Figure 680). ♂ unknown. Length of ♀ 53.7-60.7, hind femur 22.5-23.5 mm. —Iran, northern Khorasan· Torbat-e-Heydariyeh 6 D. onerosa Mistsh

Mishchenko, 1951, Doklady AN SSSR, (novaya seriya), LXXVII, 4 739, Figure 1[6].

17(16). Pronotum in both sexes in profile with arcuate middle carina (Figure 681). Subgenital plate in the ♀ with a distinct rounded median process on the posterior margin (Figure 682). . . . . 7. S. muricata Mistsh.

a (b). ♂ antennae long, third, sixth, and seventh segments of antenna rectangular, length of a single segment distinctly more than its greatest width. Hind femurs in the ♂ very slender, length of a femur 3.4-3.5 times more than its greatest width. Median carina of first abdominal tergites in the ♀ without a pointed spine on the apex (Figure 683). Length of ♂ 44.8, ♀ 79.5 mm, hind femur ♂ 19.7, ♀ 25.3 mm. —Iran central Khorasan . . . . 7a. S. muricata muricata Mistsh.

Mishchenko, 1951, Doklady AN SSSR, (novaya seriya), LXXVII 4 739, Figure 1[7].

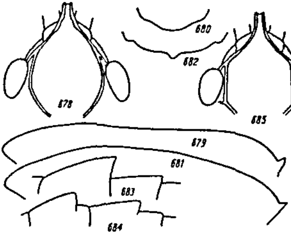
336 b (a). ♂ antennae shorter, third, sixth, and seventh segments of antenna transverse rectangular, length of a single segment distinctly less than its greatest width *Hind femur in the ♂ stouter, length of a* femur 3 times more than its greatest width Median carina of first *abdominal tergites in the ♀ with a pointed spine on the apex (Figure* 684). Length of ♂ 30 6-35.2, ♀ 62.7-68.4 mm, hind femur ♂ 15.8-16 6, ♀ 22 7-23.6 mm —Iran, northern Khorasan Torbat-e-Heydariyeh . . . . 7b. S. muricata femoralis Mistsh

Mishchenko, 1951, Doklady AN SSSR (novaya seriya), LXXLII, 4 739, Figure 1[8]

18(15). Vertex in both sexes with distinct dense granules in the anterior part, *in the ♂ always strongly depressed, in the posterior part* with a sharp median carina, in the ♀ sometimes slightly granular in the anterior part, then the vertex has distinct lateral angles (Figure 685).

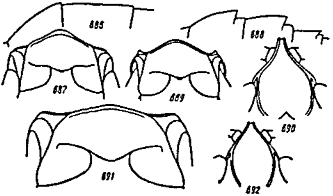
19(22). Margin of vertex in both sexes making distinct angles (Figure 685) Occiput in ♀ with only one sharp raised light streak behind the eye.

20(21). Median carina of first 2 abdominal tergites in the ♀ without a spine on the apex (Figure 686). Hind femur in the ♀ slender, length of femur 3.3 times more than its greatest width. Hind tibia in the ♀ with a black-violet inner aspect. Mesosternum in the ♂ with a



Figures 678-685
(Original)

678—Saxetania muricata muricata Mistsh., ♀, vertex from above; (allotype), 679—S. onerosa Mistsh., ♀, dorsal part of pronotum from the side (type), 680—S. onerosa Mistsh., ♀, posterior margin of subgenital plate (type), 681—S. muricata muricata Mistsh., ♀, dorsal part of pronotum from the side (allotype), 682—S. muricata muricata Mistsh., ♀, posterior margin of genital plate (allotype); 683—S. muricata muricata Mistsh., ♀, dorsal part of first abdominal tergites from the side (allotype), 684—S. muricata femoralis Mistsh., ♀, ibid. (allotype); 685—S. enoda Mistsh., ♀, vertex from above (allotype).



Figures 686-692
(Original)

686—Saxetania enoda Mistsh., ♀, dorsal part of first abdominal tergites from the side (allotype), 687—S. enoda Mistsh., ♂, mesothorax from below (type) 688—S. bactriana Mistsh., ♀, dorsal part of first abdominal tergites from the side (allotype), 689—S. bactriana Mistsh., ♂, mesothorax from below (type), 690—S. cultricollis cultricollis (Saus.), ♀, vertex from above, 691—S. cultricollis tumulosa Mistsh., ♀, mesothorax from below (allotype), 692—S. cultricollis tumulosa Mistsh., ♀, vertex from above (allotype).

wide space between the lobes; its narrowest part is considerably
337 greater than its length (Figure 687). Length of ♂ 27.5-29.8, ♀ 53.7 mm; hind femur ♂ 14.2-14.6, ♀ 22.5 mm. —*Kugitang Range Shirdzhan* . . . . *8. S. enoda Mistsh.

Mishchenko, 1951, Doklady AN SSSR, (novaya seriya), LXXVII, 4:739, Figure 1[9].

21(20). Median carina of first 2 abdominal tergites in the ♀ with a sharp spine on the apex (Figure 688). Hind femur in the ♀ stouter, length of a femur 3 times greater than its greatest width. Hind tibia in the ♀ with a dark blue-black inner aspect. Mesosternum in the ♂ with a moderately wide space between the lobes, its narrowest part is equal to its length (Figure 689). Length of ♂ 27.5-30.7, ♀ 48.4-54.6 mm, hind femur ♂ 13.3-14.4, ♀ 17.4-20.3 mm.— Southwestern part of Gissar Range and its southern spurs· Koktugai and hamlets of Khan-takht and Kzyl-tam. (Type from Kzyltam). . . . . *9. S. bactriana Mistsh.

Mishchenko, 1951, Doklady AN SSSR, (novaya seriya), LXXVII, 4:739, Figure 1[10].

22(19). Margin of vertex oval in both sexes (Figure 690), sometimes in the ♀ it makes indistinct angles in the anterior part, then the occiput has several elevated light streaks behind the eye . . . . *10. S. cultricollis (Sauss.)

a (d). Mesosternum in both sexes with roundly projecting anterior margin, narrowest part of space between the lobes in the ♀ equal to the greatest width of a mesosternal lobe (Figure 691).

b (c). Vertex in both sexes wide, its greatest width nearly 2/3 its length (Figure 690). Length of ♂ 29.5, ♀ 37.0-61.4 mm, hind femur ♂ 15.1,
338 ♀ 21.6-22.4 mm. —South Turkmenia· *Kizyl-Arvat, Bami, Ashkhabad,* Nukhur . . . . *10a. S. cultricollis cultricollis (Sauss.)

—cultricollis Saussure, 1887, Specilegia Entomologica genavensis, 2 Tribu des Pamphagiens 73 (Tropidauchen) Jakobson, 1905:199, 293 (Tropidauchen) Adelung, 1910, Hor Soc Ent. Ross, XXXIX 346, tab. XV, Figures 5, 5a, 6, 6a-c (Tropidauchen).—cultricolle Saussure, 1887, ibid 74 (Tropidauchen) Uvarov, 1927a:161, Figure 196 (Tropidauchen) (partly).

c (b). Vertex in both sexes narrower, its greatest width nearly 1/2 its length (Figure 692). Length of ♂ 25.3, ♀ 46.2-49.8 mm, hind femur ♂ 13.2, ♀ 19.4-19.6 mm. —Kopet Dag· Saratovskoe . . . . *10b. *S. cultricollis tumulosa* Mistsh

Mishchenko, 1951, Doklady AN SSSR, (novaya seriya), LXXVII, 4 740, Figure 1[11].—cultricolle Uvarov, 1927a 161, 196 (Tropidauchen) (partly)

d (a). Mesosternum in the ♀ with anterior margin angularly projecting forward, the narrowest part of space between the lobes in the ♀ is distinctly less than the greatest width of a mesosternal lobe (Figure 693). ♂ unknown. Length of body ♀ 48.2, hind femur 19.6 mm. —Southern Turkmenia Guvendore . . . . *10c. S cultricollis gibbosa Mistsh

Mishchenko, 1951, Doklady AN SSSR, (novaya seriya), LXXVII, 4:740, Figure 1[12]

23(14). Prosternal process in both sexes with 2 notches on the apex (Figure 674). Body with distinct pointed tubercles. Hind tibia in both sexes with a dark blue-black inner aspect. Length ♂ 27.5, ♀ 46.5 mm; hind femur ♂ 14.5, ♀ 21.6 mm. —Southern Turkmenia: Kara-Kala . . . . *11. S. scutata Mistsh.

Mishchenko, 1951, Doklady AN SSSR, (novaya seriya), LXXVII, 4:740, Figure 1[13].

24(13). Hind tibia in both sexes with a red inner aspect. Median carina of pronotum in the ♀ convex in the middle part. Mesosternum in the ♂ with wide lobes; greatest width of a lobe significantly greater than its length (Figure 677). Length ♂ 29.8-36.5, ♀ 52.5-67.5 mm; hind femur ♂ 13-15, ♀ 20.0-22.5 mm. —Northern Afghanistan. . . . . 12. S. uvarovi (Mistsh.)

Mistshenko, 1937, Journ. Bomb. Nat. Hist. Soc., XXXIX:801, Figures 1U, 2U (Tropidauchen).

25(10). Prosternal process distinctly bifurcate on the apex (Figure 675).
26(27). Pronotum in the ♂ with very well-developed dorsal part, which strongly projects forward, nearly reaching the middle of the vertex (Figure 694). ♀ cerci short, greatest width of a cercus is 1.5 times more than its length (Figure 695). Subgenital plate in the ♂ with 2 small tubercles on the apex (Figure 696). ♀ ovipositor on the outer ventral margin of the ventral valve dentate in the posterior part (Figure 697). Length of ♂ 47.3, ♀ 64.5 mm; hind femur ♂ 21.4, ♀ 28.4 mm. —Iran, southeastern Khorasan: southwestern part of Lake Daqq-e-Patargan, *Khouz-Musafyr west of Namaksar*. . . . . 13. S. decumana Mistsh.

Mishchenko, 1951, Doklady AN SSSR, (novaya seriya), LXXVII, 4:740, Figure 1[14].

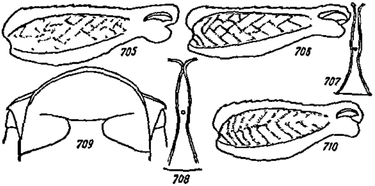
27(26). Pronotum in the ♂ with less-developed dorsal part, which slightly projects forward, reaching only the posterior part of the vertex (Figure 698). ♀ cerci narrow, greatest width of a cercus in the ♀ equal to its length (Figure 699). Subgenital plate in the ♂ without
339 tubercles on the apex (Figure 700). ♀ ovipositor almost smooth, rounded, on the outer ventral margin of the posterior part of the ventral valve (Figure 701).

28(29). Hind tibia in both sexes with sparsely punctate base; base with sparse isolated punctures; inner aspect in the ♀ colorless. Median carina of the first 3 abdominal tergites in both sexes with a sharp spine on the apex (Figure 702). Length ♂ 28.5-32.5, ♀ 51.6-54.6 mm; hind femur ♂ 15.1-16.3, ♀ 20.3-23.4 mm. —Northern Iran: Shahrud (Figure 664) . . . . 14. S. spinosa Mistsh.

Mishchenko, 1951, Doklady AN SSSR, (novaya seriya), LXXVII, 4:740, Figure 1[15].

Figures 693-704
(Original)

693—Saxetania cultricollis gibbosa Mistsh., ♀, mesothorax from below (type), 694—S. decumana Mistsh., ♂, upper part of head and pronotum from the side (type), 695—S decumana Mistsh., ♀, left cercus from the side (allotype), 696—S. decumana Mistsh., ♂, apex of subgenital plate from behind (type), 697—S. decumana Mistsh., ♀, ventral valves of ovipositor from below (allotype), 698—S. spinosa Mistsh., ♂, upper part of head and pronotum from the side (type); 699—S. spinosa Mistsh., ♀, left cercus from the side (allotype), 700—S. spinosa Mistsh., ♂, apex of genital plate from behind (type), 701—S. spinosa Mistsh., ♀, ventral valves of ovipositor from below (allotype) 702—S. spinosa Mistsh., ♀, dorsal part of first abdominal tergites from the side (allotype), 703—S. irrasa Mistsh., ♀, dorsal part of first abdominal tergites from the side (type), 704—S. miramae (Mistsh.), ♂, mesothorax from below (paratype).



Figures 705-710
(Original)

705—Paranocarodes straubei (Fieb.), ♂, left hind femur from the side, 706—P. instans Mistsh., ♂, ibid. (type), 707—P. lubricus Mistsh., ♀, frontal ridge, front view (type), 708—P. instans Mistsh., ♀, ibid. (allotype), 709—P. straubei)Fieb), ♀, mesothorax from below, 710—P sulcatus (I. Bol.), ♂, left hind femur from the side.

29 (28). Hind tibia in the ♀ with densely punctate base; base with dense coarse punctures; inner aspect violet. Median carina of first 3 abdominal tergites in the ♀ without spines on the apex (Figure 703). ♂ unknown. Length of ♀ 47.2, hind femur 22.3 mm. —Northern Iran: Mashhad . . . . 15. S. irrasa Mistsh.

Mishchenko, 1951, Doklady AN SSSR, (novaya seriya), LXXVII, 4·740, Figure 1[16].

0 30 (9). Mesosternal lobes in both sexes narrow; greatest width of a lobe 2/3 its length (Figure 704). Body with only indistinct blunt tubercles. Length ♂ 28.5-36.0, ♀ 50.5-71.5 mm; hind femur ♂ 15.5-16.8, ♀ 21.7-24.0 mm. —Northern Afghanistan . . . . 16. S. miramae (Mistsh.)

Mistshenko, 1937, Journ. Bomb. Nat. Hist. Soc., XXXIX:802, Figures 1M, 2M (Tropidauchen).

92. Genus Ananothrotes Mistsh.

Mishchenko, 1951, Doklady AN SSSR, (novaya seriya), LXXVII, 3:517. —Nocarodes Brunner-Wattenwyl, 1882:86, 188 (partim); Jakobson, 1905:172, 200, 297 (partim). —Paranocarodes I. Bolivar, 1916, Genera Insectorum, 170:22 (partim).

Fastigium bordered by a ridge. No preocellar pits. Median carina of pronotum not intersected by a transverse groove and without a median longitudinal groove; in profile low, nearly straight. No tegmina or wings. Middle tibia of ♂ without tubercles along the dorsal margin. Hind femurs with small teeth along the dorsal margin. Prosternum with a sharp conical median process on the anterior margin. Mesosternal lobes wide; greatest width of a lobe considerably more than its length. First abdominal tergite with a large tympanic organ.

Only one species, living in Asia Minor and western Iran (?), is known.

1 (1). Eyes in both sexes small; vertical diameter of eye in the ♂ 2/3, in the ♀ 1/2 the subocular groove. Hind femur in the ♀ with a black ventral aspect. Hind tibia in the ♀ with black-violet inner aspect. Length ♂ 24, ♀ 27.5-42.0 mm; hind femur ♂ 11.8, ♀ 12.3-20.0 mm. —Southern part of Asia Minor, Iran (?) . . . . 1. A. fieberi (Br.-W.)

Brunner-Wattenwyl, 1882·189 (Nocarodes), Jakobson, 1905·200, 298 (Nocarodes).

93. Genus Paranocarodes I. Bol.

I. Bolivar, 1916, Genera Insectorum, 170 22 (partim); Uvarov, 1927a:160, 163 (partim); Tarbinskii, 1940 34, 213, 215 (partim). —Nocarodes Brunner-Wattenwyl, 1882:86, 188 (partly); Jakobson, 1905 172, 200, 297 (partim).

Type of genus: Paranocarodes straubei (Fieb.).

Fastigium bordered by a ridge. No preocellar foveolae. Median carina of pronotum not intersected by a transverse groove and with or without hardly perceptible median longitudinal groove, in profile, arcuate. No tegmina or wings. Middle tibia of ♂ without tubercles along the dorsal margin. Hind femur with small teeth on the dorsal margin. Prosternum with distinct pointed median process on the anterior margin. Mesosternal lobes wide, greatest width of a lobe equal to or distinctly more than its length. Abdomen with large tympanic organ on the first tergite; the first 2, and sometimes all the tergites with a sharp produced posterior apical spine, their middle carina pectinate in profile.

Four species, distributed in Asia Minor and in Syria, are known

41 1 (6). Hind femur slender; ventral lobe of outer aspect of femur slightly widened at the middle; length of femur 3-3.5 times more than its greatest width (Figures 705, 706).

2 (3). Frontal ridge in the ♀ gradually [or by degrees, in steps] diverging toward the clypeus (Figure 707). Median carina of pronotum in the ♀ entire, without median longitudinal groove. Mesosternal lobes of ♀ moderately wide, the greatest width of a lobe is equal to its length (Figure 603). ♂ unknown. Length ♀ 35.2, hind femur 14.2 mm. —South Asia Minor· Cilician Taurus . . .1. P. lubricus Mistsh.

Mishchenko, 1951, Doklady AN SSSR, (novaya seriya), LXXVII, 3 517, Figure 1[1]

3 (2). Frontal ridge in both sexes distinctly widened above the median ocellus (Figure 708). Median carina of pronotum in both sexes with a median longitudinal groove, sometimes clearly emphasized [or readily visible] only in the anterior part of the pronotum. Mesosternal lobes of ♀ very wide; greatest width of a lobe distinctly more than its length (Figure 709).

4 (5). Frontal ridge of ♀ strongly depressed in the dorsal part. Hind femur of ♂ with well-developed dorsal carina, length of femur 3 times more than its greatest width (Figure 705). Hind tibia of ♂ red, ♀ orange Length ♂ 22.0-26.3, ♀ 34.6-45.0 mm, hind femur ♂ 10.5-11.2, ♀ 15.6-17.5 mm. —Asia Minor. . . . . .2. P. straubei (Fieb.)

Fieber, 1853, Lotos, III 127 (Pamphagus), Brunner-Wattenwyl, 1882 188, 189 (Nocarodes) Jakobson, 1905 200, 298 (Nocarodes) (partim), Tarbinskii, 1940 34

5 (4). Frontal ridge of ♀ hardly depressed in the dorsal part, almost flat. Hind femur of ♂ with hardly-marked dorsal carina; length of a femur 3.5 times more than its greatest width (Figure 706). Inner aspect of
342 hind tibia of ♂ black, ♀ black-brown. Length ♂ 24 5, ♀ 51.2 mm, hind femur ♂11.8, ♀ 17.7 mm. —Asia Minor Anatolia . . . . 3. P. instans Mistsh.

Mishchenko, 1951, Doklady AN SSSR, (novaya seriya), LXXVII, 3.517, Figure 1[2].

6 (1). Hind femur stout; ventral lobe of outer aspect of femur strongly developed at the middle; length of femur 2-2.5 times more than its greatest width (Figure 710). Length ♂ 17.5-22.5, ♀ 46.2 mm, hind

femur ♂ 7.7-9.8, ♀ 13.4 mm. —Asia Minor, Syria . . . . 4. P. sulcatus (I. Bol.)

Ramme, 1939, Mitt. Zool. Mus. Berlin, XXIV:136, tab. II, Figure 3. —straubei var. sulcatus I. Bolivar, 1912:28 (Nocarodes). —straubei Jakobson, 1905:200, 298 (Nocarodes) (partim).

94. Genus Eunothrotes Ad.

Adelung, 1907, Trudy Russkogo entomologicheskogo obshchestva, XXXVIII:60; Tarbinskii, 1940:34, 213.

Body slender. Fastigium bordered by a little ridge. Preocellar foveolae absent. Middle carina of pronotum not intersected by a transverse groove and with a distinct median longitudinal groove; in profile slightly arcuate. No tegmina or wings. Middle tibia of ♂ without tubercles along the dorsal margin. Hind femur with small teeth on the dorsal margin. Empodium between the claws of the tarsi wide, large, extending beyond the middle of the claws. Prosternum with distinct pointed median process on the anterior margin. Mesosternal lobes moderately wide; greatest width of a lobe nearly equal to its length. Abdomen with a large tympanic organ on the first tergite; first 2 tergites simple without a sharp posterior apical spine; their middle carina in profile low, straight.

One species from Transcaucasia and northeastern Turkey is known.

1 (1). Vertex in both sexes with small granules only in the anterior part. Eyes in both sexes large, the horizontal diameter of an eye equal to the distance from fastigium to anterior eye-margin. Inner aspect of hind ♂ tibia red, ♀ orange. Length of ♂ 24.2-26.4, ♀ 37.5-45.7 mm; hind femur ♂ 11.0-11.7, ♀ 15-18 mm. —Adzharia, Armenia: northeastern Turkey . . . . 1. Eu. derjugini Ad.

Adelung, 1907, Trudy Russkogo entomologicheskogo obshchestva, XXXVIII:61, plate I, Figures 3, 3a–c, Tarbinskii, 1940:34.

95. Genus Pseudonothrotes Mistsh.

Mishchenko, 1951, Doklady AN SSSR, (novaya seriya), LXXVII, 3:518.

Vertex narrow; its width between the eyes in the ♂ considerably less than the horizontal diameter of the eye, but in the ♀ it is equal to it; fastigium bordered by a small ridge. No preocellar foveoloa. Median carina of pronotum not intersected by a transverse groove and with a distinct median longitudinal groove; in profile convex. No tegmina or wings. Hind femurs with small teeth on the dorsal margin. Empodium between the tarsal claws narrow, small, hardly reaching the middle of the claws. Prosternum with a weakly-developed anterior margin which has a distinct median pointed process. Mesosternal lobes wide; greatest width of a lobe greater than its
343 length. Abdomen with a large tympanic organ on the first tergite; the first

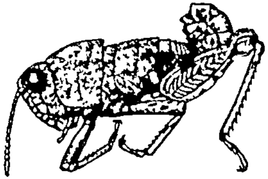


Figure 711. Pseudonothrotes levis Mistsh., ♂ (paratype). (Original)

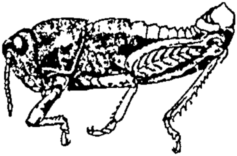


Figure 712. Paranothrotes tenuicornis tenuicornis Mistsh., ♂ (paratype). (Original)

2 tergites simple without a sharp posterior apical spine; their median carina in profile low, straight.

Only one species from northeastern Turkey is known.

1 (1). Eyes large; vertical diameter of the eye in the ♂ 1.5 times greater than the subocular groove, but in the ♀ it is equal to it. Antennae 15-16 segmented. Mesosternal space wide; its narrowest part 1.5 times more than its length. Hind femurs with light inner and ventral aspects. Hind tibia with red-orange inner aspect. Length of ♂ 22.7-23.4, ♀ 38.7-45.5 mm; hind femur ♂ 9.5-10.1, ♀ 14.4-14.8 mm. — Northeastern Turkey: Lomasheny near Artvin (Figure 711) . . . . 1. P. levis Mistsh.

Mishchenko, 1951, Doklady AN SSSR, (novaya seriya), LXXVII, 3:519, Figure 1[3].

96. Genus Paranothrotes Mistsh.

Mishchenko, 1951, Doklady AN SSSR, (novaya seriya), LXXVII:3:519. —Nocarodes Brunner-Wattenwyl, 1882-86, 188 (partly), Jakobson, 1905:172, 200, 297 (partly). —Paranocarodes Uvarov, 1927a:160, 163 (partly), Tarbinskii, 1940:34, 213, 215 (partly).

Type of genus: Paranothrotes tenuicornis Mistsh.

Body thickset. Fastigium bordered by a small ridge. No preocellar foveolae. Antennae 12-, rarely 13-14 segmented. Median carina of pronotum not intersected by a transverse groove and with a distinct median longitudinal groove; in profile convex. No tegmina or wings. Hind femur with small teeth on the dorsal margin. Empodium between the claws of the tarsi narrow, small, hardly reaching the middle of the claws. Prosternal with slightly-developed anterior margin, which has a distinct median pointed process. Mesosternal lobes wide; greatest width of a lobe usually greater than its length. Abdomen with a large tympanic organ on the first tergite; the first 2 tergites simple, without sharp posterior apical spine; their median carina in profile low, straight.

Seven species, distributed in Transcaucasia, Asia Minor, Iraq, and Iran, are known.

344 1 (6). Frontal ridge in both sexes convex in the dorsal part, in profile, strongly projecting anteriorly (Figure 713), sometimes not projecting in the ♀, then the antennae are 14 segmented.

2 (3). Hind femur in the ♂ light in the apical part of the inner aspect. Hind tibia in the ♂ with reddish inner aspect. ♀ unknown. Length ♂ 23.5, hind femur 11 mm. —Asia Minor· Anatolia (According to Ebner) . . . . 1. P. tölgi (Ebn.)

Ebner, 1919, Arch. Naturg., Abt. A, LXXXV 173, Figure 3 (Nocarodes).

3 (2). Hind femur in both sexes black or blackish in the apical part of the inner aspect, sometimes in the ♀ with only a light preapical band. Hind tibia in both sexes with a black or a blackish inner aspect.

4 (5). Vertex in both sexes with effaced rugulae; in the ♀ very wide; its width between the eyes 1.5 times more than the vertical diameter of an eye (Figure 714). Occiput in both sexes with effaced rugulae . . . . 2. P. gotvendicus (I. Bol.)

a(b). Vertex in profile with rounded fastigium, making an obtuse angle with the frontal ridge; its posterior part in profile is convex. Occiput in profile convex, projecting upward (Figure 715). Length of ♂ 21.8-22.0, ♀ 35.0-42.7 mm; hind femur ♂ 8.5-10.6, ♀ 13.2-15.7 mm. — Northeastern Iraq, western Iran. . . . . 2a. P. gotvendicus gotvendicus (I. Bol.)

—gotvendicus I. Bolivar, 1912:29 (Nocarodes)

b(a). Vertex in profile with pointed fastigium, making a right angle with the frontal ridge; its posterior part nearly flat in profile. Occiput in profile nearly flat, weakly projecting upward (Figure 713). Length of ♂ 19.6-21.2, ♀ 34.6-51.3 mm, hind femur ♂ 8.6-9.5, ♀ 15.2-17.3 mm. —Northeastern Iraq· Tawile, western Iran Sirv-gora, Abbasan and Kani rivers. (Type from the Abbasan) . . . . 2b. P. gotvendicus rectus Mistsh.

Mishchenko, 1951, Doklady AN SSSR, (novaya seriya), LXXVII, 3 519, Figure 1[4]

5 (4). Vertex in the ♀ with sharp rugulae, narrow, its width between the eyes is equal to the vertical diameter of the eye (Figure 716) Occiput in the ♀ with sharp rugulae. ♂ unknown. Length ♀ 40.8, hind femur 13.9 mm. —Western Iran, Kurdistan Syakh-gyurez. . . . . 3. P. ocellatus Mistsh.

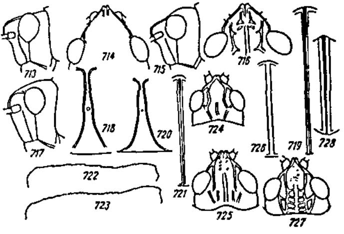
Mishchenko, 1951, Doklady AN SSSR, (novaya seriya), LXXVII, 3 519, Figure 1[5].

6 (1). Frontal ridge in both sexes flat in the dorsal part, in profile, not projecting forward (Figure 717). Antennae in the ♀ 12 segmented.

7(12). Hind femur in both sexes usually slender, length of femur 3-3.25 times more than its greatest width, sometimes in the ♂ 2.5 times more than that, then the inner aspect of the hind tibia is light.

8(11). ♂ antennae 13-, sometimes 12 segmented, then the vertex is slightly depressed and the metasternum is either densely punctate only at the posterior margin of the mesosternal lobes with its remaining part sparsely punctate, or its whole surface has sparsely scattered punctation Hind femur in the ♀ with a dark inner aspect which has a light preapical band.

9(10). Frontal ridge in the ♀ flat and narrow above the median ocellus (Figure 718). ♂ antennae 13 segmented, Median carina of pronotum in
345 both sexes distinctly cleft by a median longitudinal groove only in the anterior part, the groove narrows sharply toward the posterior margin of the pronotum (Figure 719). Length ♂ 20.4-21.3, ♀ 45.6-47.3 mm, hind femur ♂ 9.4-10.6, ♀ 14.4-14.7 mm. —Northeastern Turkey Mt. Sary-baba near Kagizman, Caban, Tut near Kagizman . . . . 4. P. eximius Mistsh



Figures 713–728
(Original)

713—Paranothrotes gotvendicus rectus Mistsh., ♂, head from the side (type), 714—P. gotvendicus rectus Mistsh., ♀, vertex from above (allotype); 715—P. gotvendicus gotvendicus (I. Bol.), ♂, head from the side, 716—P. ocellatus Mistsh., ♀, vertex from above (type); 717—P. eximius Mistsh., ♂, head from the side (type); 718—P. eximius Mistsh., ♀, frontal ridge, front view (allotype), 719—P. eximius Mistsh., ♀, median carina of pronotum from above (allotype); 720—P. tenuicornis tenuicornis Mistsh., ♀, frontal ridge, front view (allotype), 721—P. tenuicornis tenuicornis Mistsh., ♀, median carina of pronotum from above (allotype), 722—P. tenuicornis tenuicornis Mistsh., ♂, dorsal margin of left hind femur from the side (type), 723—P. tenuicornis sordidus Mistsh., ♂, ibid. (type), 724—P. opacus opacus (Br.-W.), ♂, head from above, 725—P. opacus ornatus Mistsh., ♂, ibid. (type), 726—P. opacus ornatus Mistsh., ♂, median carina of pronotum from above (type), 727—P. opacus nigripes (Stshelk.), ♂, head from above (paratype), 728—P. opacus shelkovnikovi (Uv.), ♂, median carina of pronotum from above (paratype).

Figure 729. Znojkiana znojkoi (Mir.), ♂ (paratype). (Original)

Muhchenko, 1951, Doklady AN SSSR, (novaya seriya), LXXVII, 3:519, Figure 1[6].

10(9). Frontal ridge in the ♀ strongly depressed, distinctly widened above the median ocellus (Figure 720). Antennae in the ♂ 12 segmented. Median carina of pronotum in both sexes uniformly split by a median longitudinal groove for its whole length; the groove is not narrowed toward the posterior margin of the pronotum (Figure 721). . . . . 5. P. tenuicornis Mistsh.

a(b). Hind femur in the ♂ with sparse teeth along the dorsal margin (Figure 722). Hind tibia in the ♀ with red or reddish innner aspect. Length of ♂ 18.4-22.2, ♀ 29.2-37.2 mm, hind femur ♂ 8.2-9.6, ♀ 12.4-13.6 mm. —Northern Iran Elburz Mts., Shaku, Kuzluk. (Figure 712). . . . . 5a. P. tenuicornis tenuicornis Mistsh.

Mishchenko, 1951, Doklady AN SSSR, (novaya seriya), LXXVII, 3:520, Figure 1[7].

b(a). Hind femur of ♂ with many teeth along the dorsal margin (Figure 723). Hind tibia of ♀ with blue-black inner aspect. Length of ♂ 20.3, ♀ 32.5 mm; hind femur ♂ 9.2, ♀ 14.3 mm. —Northern Iran Teheran. . . . . 5b. P. tenuicornis sordidus Mistsh.

Mishchenko, 1951, Doklady AN SSSR, (novaya seriya), LXXVII, 3:520, Figure 1[8].

11(8). ♂ antennae 12 segmented. ♂ vertex always strongly depressed. All the metathorax in the ♂ always densely punctate. Hind femur in the ♀ with unicolored inner aspect, which is light, gray-black, or black, but always without a light preapical band. *6. P. opacus (Br.-W.)

a(j). Hind tibia in both sexes with unicolored inner aspect, which is yellow, brown, red, gray, blue, dark blue-black, or black.

b(e). Median carina of vertex and occiput in the ♂ reaching only the middle of the eyes (Figure 724). Hind femur in the ♀ with a yellow, reddish, or gray ventral aspect, sometimes it has a black band along the inner margin. Hind tibia in the ♂ with a yellow or brown inner aspect.

c(d). Hind tibia in the ♂ with a brown inner aspect, but in the ♀ it is brown, gray, dark blue, or dark blue-black. Length of ♂ 21.0-25.7, ♀ 45.0-50.4 mm; hind femur ♂ 11.0-12.5, ♀ 15.5-19.0 mm. —Northwestern Iran. . . . . 6a. P. opacus opacus (Br.-W.)

—opacus Brunner-Wattenwyl, 1882 189 (Nocarodes) Jakobson, 1905 200, 298 (Nocarodes);
346 Uvarov, 1927a 163, Figures 196-200 (Paranocarodes) Tarbinskii, 1940 34, 215 (Paranocarodes).

d(c). Hind tibia in the ♂ with a yellow inner aspect, but in the ♀ it is red. Length of ♂ 19.9, ♀ 32.4-56.4 mm; hind femur ♂ 10.6, ♀ 13.5-19.5 mm. —Georgia, Armenia, Nakhichevan A S S R, northwestern Iran . . . . *6b. P. opacus margaritae (Mir.)

—margaritae Miram, 1938, Trudy Zoologicheskogo Instituta Azerbaidzhanskogo filiala AN SSSR, VIII/42 51 (Nocaracris). —armeniaca Bei-Bienko, 1941, Zapiski Leningradskogo sel'skokhozyaistvennogo Instituta, 4 157 (Nocaracris).

e(b). Median carina of vertex and occiput in the ♂ reaching the anterior margin of the eyes (Figure 725). Hind femur in the ♀ with blackish or black ventral aspect. Hind tibia in the ♂ with a black inner aspect.

f(i). Median carina of pronotum cleft by a narrow shallow median longitudinal groove; narrowest part of the groove somewhat less than the width of the lateral aspect of the median carina (Figure 726).

347 g(h). ♂ vertex with nearly parallel margins between the eyes (Figure 725). Hind tibia in the ♀ with light spines on the dorsal aspect, the apexes of which are black. Lobes of mososternum and the metasternum of the ♂ with sparse scattered punctation. Length ♂ 24.5-25.4, ♀ 46.5-52.5 mm; hind femur ♂ 10.9-12.7, ♀ 18.2-19.5 mm. —Northwest Iran: Saroga-darya River in Karadag; Savalan . . . . 6c. P. opacus ornatus Mistsh.

Mishchenko, 1951, Doklady AN SSSR, (novaya seriya), LXXVII, 3:520, Figure 1[9].

h(g). ♂ vertex with arcuate margins between the eyes, which distinctly converge toward the median carina in the posterior part (Figure 727). Hind tibias in the ♀ with black spines along the dorsal aspect. Lobes of mesosternum and metasternum of the ♂ densely punctate. Length ♂ 20.4-26.4, ♀ 39.5-53.5 mm; hind femur ♂ 10.4-12.6, ♀ 13.5-15.6 mm. —Azerbaijan. . . . . 6d. P. opacus nigripes (Stshelk.)

—opacus var. nigripes Shchelkanovtsev, 1916, Izvestiya Kavkazskogo muzeya, X:2 (Nocarodes). — opacus f. nigripes Tarbinskii, 1940:215, 216 (Paranocarodes).

i(f). Median carina of pronotum cleft by a wide deep median longitudinal groove; the narrowest part of the groove is equal to the width of a lateral aspect of the median carina (Figure 728). Length ♂ 26.0-26.7 ♀ 62.6-66.0 mm; hind femur ♂ 11.5-12.5, ♀ 18.0-19.2 mm. —Iran, Iranian Azerbaijan: Maragheh, Mt. Kuh-i-Sahand . . . . 6e. P. opacus shelkovnikovi (Uv.)

—schelkovnikovi Uvarov, 1918, Izvestiya Kavkazskogo muzeya, XII:53, 59, Figures 16, 17 (Nocarodes).

j(a). Hind tibia in the ♀ with bi-colored inner aspect, in the basal part it is dark blue, in the apical part red. ♂ unknown. Length of ♀ 46.6-51.6, hind femur 17.0-18.6 mm. —Western Iran. . . . . 6f. P. opacus apicalis (I. Bol.)

—apicalis I. Bolivar, 1912:29 (Nocarodes)

12(7). Hind femur in the ♂ stout; length of femur 2.5 times more than its greatest width. Hind tibia in the ♂ with a black inner aspect. ♀ unknown. Length of ♂ 21.3-22.8, hind femur 9.7-9.9 mm. —Western Iran: Avroman Mts. in Kurdistan. . . . . . 7. P. citimus Mistsh.

Mishchenko, 1951, Doklady AN SSSR, (novaya seriya), LXXVII, 3:520, Figure 1[10].

97. Genus Oronothrotes Mistsh.

Mishchenko, 1951, Doklady AN SSSR, (novaya seriya), LXXVII, 3 520.

♂ body thickset. Fastigium bordered by a small ridge. No preocellar fo-
veolae. Antennae 12 segmented. Median carina of pronotum not intersected
by a transverse groove, but with a distinct median longitudinal groove, con-
vex in profile. No tegmina and wings. Hind femurs with small teeth on the
dorsal margin. Prosternum with strongly-developed anterior margin, raised
a little in the form of a collar, with wide rounded apex and with 2 very in-
distinct lateral notches. Mesosternal lobes wide; the greatest width of a
lobe is more than its length. Abdomen with a distinct tympanic organ on
the first abdominal tergite; first 2 tergites simple, without a sharp poste-
rior apical spine, their median carina in profile low, straight.

Only one species, living in Anatolia, is known.

18 1 (1). Body of ♂ with indistinct tubercles. Vertex of ♂ slightly depressed,
wide; its greatest width nearly equal to the vertical diameter of the
eye. Median carina of pronotum in the ♂ sharply cleft by a median
longitudinal groove only in the anterior part, median groove sharply
narrowed toward the posterior margin of the pronotum. Hind tibias
in the ♂ blackish. ♀ unknown. Length of ♂ 24.8, hind femur 10.7
mm. —Asia Minor: Anatolia . . . . 1. O. furvus Mistsh.

Mishchenko 1951, Doklady AN SSSR, (novaya seriya), LXXVII, 3 520, Figure 1[11]

98. Genus Znojkiana Mistshenko gen. n.

Fastigium bordered by a small ridge. No preocellar foveolae. Median ca-
rina of pronotum not intersected by a transverse groove. No tegmina or
wings. Mesosternal lobes triangular, gradually narrowed toward the mid-
dle of the mesosternum; ventral margin of lobes only slightly arcuately
curved. Metasternum with its anterior margin slightly arcuately curved in
the middle, slightly projecting in the region of the mesosternom. First ab-
dominal tergite without tympanic organ.

Only one species, inhabiting the Nakhichevan A S. S R is known

1 (1). Body with small granules. Hind femur with small teeth on the dorsal
margin. Hind tibia in the ♂ with orange inner aspect, but in the ♀
it is blue. Length ♂ 17.3-18.0, ♀ 30.0-31.5, hind femur ♂ 7.0-7.2, ♀
10.0-12.3 mm. —Nakhichevan A S. S R (Figure 729) . . . .
. . . . *1. Z. znojkoi (Mir.)

Miram, 1938, Trudy Zoologicheskogo Instituta Azerbaidzhanskogo filiala AN SSSR, VIII/42:49, Figures 11-14 (Nocarodes).

99. Genus Araxiana Mistshenko gen. n.

—Nocaracris Tarbinskii, 1940:34, 213, 214 (partim)

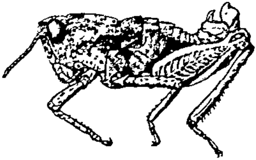


Figure 730. Araxiana voronovi (Uv.), ♂ (paratype). (Original)

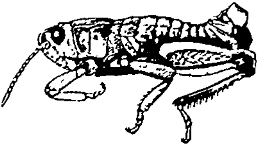


Figure 731. Nocaracris cyanipes (F.-W.), ♂. (Original)

Figures 732, 733
(Original)

732—Nocaracris cyanipes (F.-W.), ♀, head from side. 733—N. curtus Mistshenko sp. n., ♀, ibid. (allotype).

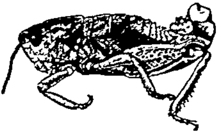


Figure 734. Paranocaracris elegans Mistshenko gen. et sp. n., ♂ (paratype). (Original)

Body slender. Frontal ridge in profile slightly sloping, its margins nearly parallel in the dorsal half, sharply diverging toward the clypeus under the median ocellus. Fastigium bordered by a small ridge. No preocellar foveolae. Median carina of pronotum not intersected by a transverse groove but with a distinct median longitudinal groove. No tegmina or wings. Hind femurs with only small teeth along the dorsal margin, dorsal lobe of femur hardly but uniformly developed along the whole femur. Mesosternum in the ♂ with small scattered punctation, its lobes trapezoidal in both sexes. ventral margin of a lobe sharply curved [or bent] at an angle, forming its inner margin. Metasternum in the ♂ with small scattered punctation; its anterior margin in both sexes distinctly bent twice at an angle in the middle, its median process strongly projecting into the region of the mesosternum; greatest width of metasternum in both sexes considerably less than the length of the meso- and metasternum together. First abdominal tergite without tympanic organ.

49 Only one species, living in the Nakhichevan A. S S R., is known

1 (1). Body with small granules. Vertex slightly depressed. Pronotum with very indistinct lateral carinae. Hind tibia in the ♂ with a brown-violet inner aspect, but in the ♀ it is violet. Length ♂ 17.2-20.0, ♀ 32.0-37.4 mm, hind femur ♂ 9.4-10.0, ♀ 13.6-14.0 mm. —Nakhichevan A. S. S. R : Ordubat (Figure 730) . . . . . . *1. A. voronovi (Uv.)

—woronowi Uvarov, 1918, Izvestiya Kavkazskogo muzeya, XII 56, Figures 9, 10w, 12 (Nocarodes), Tarbinskii, 1940:34 (Nocaracris).

100. Genus Nocaracris Uv.

Uvarov, 1928, Russkoe entomologicheskoe obozrenie, XXII, 3-4:149 (partim), Tarbinskii, 1940 34, 213, 214 (partim), Tarbinskii, 1948 126. —Nocarodes Brunner-Wattenwyl, 1882 86, 188 (partim), Jakobson, 1905:172, 200, 297 (partim).

Type of genus Nocaracris cyanipes (F.-W.)

Body thickset. Frontal ridge in profile strongly sloping, its margins gradually diverging toward the clypeus. Fastigium bordered by a small ridge. No preocellar foveolae. Median carina of pronotum not intersected by a transverse groove but with a distinct wide median longitudinal groove which uniformly cleaves to the median carina for all its length with no narrowing toward the posterior margin of the pronotum. No tegmina or wings. Hind femur with only small teeth along the dorsal margin, dorsal lobe of femur slightly but uniformly developed all along the femur. Mesosternum in the ♂ with small scattered punctation its lobes in both sexes trapezoidal, ventral margin of a lobe sharply bent at an angle, its inner margin also sharply bent. Metasternum in the ♂ with small scattered punctation, its greatest width in both sexes equal to or greater than the length of the meso- and metasternum together, its anterior margin in both sexes sharply bent at an angle twice, in the middle, its median process strongly projecting into the region of the mesosternum First abdominal tergite without tympanic organ.

Two species, distributed in the Caucasus, in northeastern Turkey, and in Iran (?), are known.

1 (2). Frons and vertex in the ♀ strongly sloping. Occiput in the ♀ convex (Figure 732). Hind femur in both sexes with a black, a dark blue-

black, rarely a blackish-red ventral aspect. Hind tibia in the ♀ with a black or dark blue-black inner aspect. Length ♂ 16.7-23.3, ♀ 27.8-37.3 mm; hind femur ♂ 9.0-10.4, ♀ 12.5-15.0 mm. —The Caucasus; northeastern Turkey, Iran (?). (Figure 731) . . . . *1. N. cyanipes (F.-W.)

Fischer-Waldheim, 1846 269, tab. XXXI, Figure 2 (Nocarodes), Brunner-Wattenwyl, 1882:189, 190 (Nocarodes) (partim), Jakobson, 1905:200, 298, Figure 32 (Nocarodes) (partim); Uvarov, 1928, Russkoe entomologicheskoe obozrenie, XXII:150, Figures 1C; Tarbinskii, 1940:34, 214 (partim); Tarbinskii, 1948:126 (partim).

350 2 (1). Frons in the ♀ nearly vertical. Vertex in the ♀ nearly horizontal. ♀ occiput flat (Figure 733). Hind femur in both sexes with red ventral aspect. Hind tibia in the ♀ with a red inner aspect. Length ♂ 18.6, ♀ 28.5-32.8 mm; hind femur ♂ 8.2, ♀ 11.6-12.4 mm. —Georgia, Adzharia: Mt. Mereti. . . . . *2. N. curtus Mistshenko sp. n.

—cyanipes Tarbinskii, 1940:34, 214 (partim); Tarbinskii, 1948:126 (partim).

101. Genus Paranocaracris Mistshenko gen. n.

—Nocarodes Brunner-Wattenwyl, 1882:86, 188 (partly), Jakobson, 1905:172, 200, 297 (partim).—Nocaracris Uvarov, 1928, Russkoe entomologicheskoe obozrenie, XXII, 3-4:149 (partim); Tarbinskii, 1940:34, 213, 214 (partim).

Type of genus: Paranocaracris elegans Mistshenko gen. et sp. n.

Body thickset. Frontal ridge in profile strongly sloping; its margins gradually diverging toward the clypeus. Fastigium bordered by a small ridge. No preocellar foveolae. Median carina of pronotum not intersected by a transverse groove but with a distinct median longitudinal groove; the groove narrows sharply toward the posterior margin of the pronotum. No tegmina or wings. Hind femur with only small teeth along the dorsal margin; dorsal lobe of femur hardly but uniformly developed along the whole femur.† Mesosternum in the ♂ with small scattered punctation; its lobes in both sexes trapezoidal; the ventral margin of a lobe is sharply bent at an angle forming by that its inner margin. Metasternum in the ♂ with small scattered punctation; its greatest width in both sexes equal to or greater than the length of the meso- and metasternum together; its anterior margin in both sexes sharply and twice bent at an angle near the middle; its median process strongly projecting into the region of the mesosternum. First abdominal tergite without tympanic organ.

351 Ten species are known which are distributed in Bulgaria, Asia Minor and the Caucasus.

1 (16). Pronotum with distinct lateral carinae and with a distinct median carina; its surface is distinctly depressed on the sides of the median carina.

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† [For this dorsal lobe of femur, see Figure 12, p. 11 of text. The word translated as lobe may also mean: fan, blade, paddle, etc.]

2 (9). Hind tibia in both sexes with a blue-black, a black, or a blackish inner aspect which is sometimes red in the ♂, then the inner aspect of the hind femur is red and the greatest width of a mesosternal lobe is considerably more than its length (Figure 735).

3 (6). Eyes in the ♀ small; the horizontal diameter of an eye is considerably smaller than the distance from the anterior margin of the eye and to the margin of the frontal ridge. Hind femur in the ♂ with a red or a reddish-black inner aspect.

4 (5). Vertex in both sexes narrow; its width between the eyes equal to the vertical diameter of the eye (Figure 737); fastigium in profile rounded, making an obtuse angle (Figure 738) with the frontal ridge. Length ♂ 20.4-25.3, ♀ 29.3-44.6 mm, hind femur ♂ 9.4-10.7, ♀ 11.7-14.6 mm. —North Ossetian A S S R , Azerbaijan, Nakhichevan A S S R , Armenia, eastern Turkey, Iran (?) . . . . *1. P. rubripes (F.-W.)

Fischer-Waldheim, 1846 270 (Nocarodes), Uvarov, 1928, Russkoe entomologicheskoe obozrenie, XXII, 3-4 150, Figure 1R (Nocaracris), Tarbinskii, 1940 34, 214, 215 (Nocaracris). —cyanipes Brunner-Wattenwyl, 1882:189, 190 (Nocarodes) (partim), Jakobson, 1905 200, 298 (Nocarodes) (partim).

5 (4). Vertex in the ♀ wider, its width between the eyes considerably greater than the vertical diameter of an eye (Figure 739); fastigium in profile not rounded, making almost a right-angle with the frontal ridge (Figure 736). ♂ unknown. Length of ♀ 29.5-44.3, hind femur 10.6-12.7 mm. —Western Georgia Mingrelia . . . . *2. P. granosus Mistshenko sp. n.

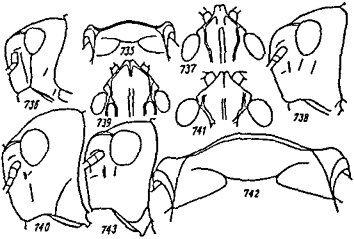
6 (3). ♀ eyes larger, horizontal diameter of the eye equal to the distance from the anterior margin of the eye to the margin of the frontal ridge (Figure 740). Hind femur in the ♂ with a black inner aspect.

7 (8). Head in the ♀ large, strongly projecting forward. ♀ vertex strongly sloping (Figure 740), wide; its width between the eyes considerably greater than the vertical diameter of the eye (Figure 741). Mesosternal lobes in the ♀ wide; greatest width of a lobe 1.5 times more than its length (Figure 742). ♂ unknown. Length ♀ 36.5-43.6, hind femur 12.5-13.5 mm. —Southern part of Asia Minor Dumbelek Dag in the Taurus. . . . . 3. P. rigidus Mistshenko sp n

8 (7). ♀ head small, slightly projecting forward. ♀ vertex nearly horizontal
352 (Figure 743) narrower, its width between the eyes in the ♂ less than but in the ♀ equal to the vertical diameter of the eye (Figure 744). Mesosternal lobes in both sexes narrower, greatest width of a lobe slightly more than its length (Figure 745). Length ♂ 19.0-21.8, ♀ 36.5-43.0 mm, hind femur ♂ 8.0-8.4, ♀ 13.0-13.3 mm. —Asia Minor: Elma Dag, Amasya. . . . . 4. P. bodenheimeri (Uv.)

Uvarov, 1940, Ann. Mag Nat. Hist., (11), VI 524, Figure 2 (Nocarodes)

9 (2). Hind tibia in both sexes with a brown, a red, or a reddish inner aspect. Hind femur in the ♂ usually with a black inner aspect, sometimes it is red, then the greatest width of a mesosternal lobe is nearly equal to its length (Figure 746).



Figures 735-743
(Original)

735—**Paranocaracris rubripes** (F.-W.), ♂, mesothorax from below; 736—**P. granosus** *Mistshenko gen. et sp. n.*, ♀, head from the side (type); 737—**P. rubripes** (F.-W.), ♀, vertex from above, 738—**P. rubripes** (F.-W.), ♀, head from the side; 739—**P. granosus** Mistshenko gen. et sp. n., ♀, vertex from above (type), 740—**P. rigidus** Mistshenko gen. et sp. n., ♀, head from the side (type); 741—**P. rigidus** Mistshenko gen. et sp. n., ♀, vertex from above (type); 742—**P. rigidus** Mistshenko gen. et sp. n., ♀, mesothorax from below (type), 743—**P. bodenheimeri** Uv., ♀, *head from the side.*

Figures 744-754
(Original)

744—**Paranocaracris bodenheimeri** (Uv.), ♀, vertex from above, 745—**P. bodenheimeri** (Uv.), ♀, mesothorax from below; 746—*P. rimansonae rimansonae* (Uv.), ♂, *mesothorax from below*, 747—**P. latipes** (Uv.), ♂, ibid. (paratype), 748—**P. latipes** (Uv.), ♀, head from the side (paratype), 749—**P. bulgaricus** (Ebn. et Drenow.), ♀, ibid. (paratype); 750—**P. bulgaricus** (Ebn. et Drenow.), ♂, mesothorax from below (paratype). 751—**P. elegans** Mistshenko gen. et sp. n., ♂, vertex from above, (type), 752—**P. elegans** Mistshenko gen. et sp. n., ♀, ibid. (allotype) 753—**P. tridentatus** (Stshelk.), ♂, ibid. (type), 754—**P. tridentatus** (Stshelk.), ♀, ibid. (paratype).

10(13). Hind femur in both sexes with a black inner aspect; sometimes in the ♂ it is blackish-red, then the narrowest part of the space between the lobes of the mesosternum is nearly equal to the narrowest part of one mesosternal lobe (Figure 747).

11(12). ♀ vertex strongly depressed; its margins sharp. Eyes in the ♀ nearly round (Figure 748). Mesosternum in the ♂ with a moderately wide space between the lobes; its narrowest part is nearly equal to the narrowest part of a mesosternal lobe (Figure 747). Length ♂ 19.5-19.8, ♀ 33.5-44.3; hind femur ♂ 8.3-8.6, ♀ 12.4-13.2 mm. —North Ossetian A. S. S. R. . . . . *5. P. latipes (Uv.)

Uvarov, 1928, Russkoe entomologicheskoe obozrenie, XXII, 3-4 151, Figure 1L (Nocaracris), Tarbinskii, 1940 34 (Nocaracris).

353 12(11). Vertex in the ♀ flat; its margins barely marked. Eyes in the ♀ oval (Figure 749). Mesosternum in the ♂ with a narrow space between the lobes; its narrowest part 2/3 of the narrowest part of one mesosternal lobe (Figure 750). Length ♂ 19-24, ♀ 37-46 mm, hind femur ♂ 9.4-9.7, ♀ 13.8-15.1 mm. —Bulgaria . . . . 6. P. bulgaricus (Ebn. et Drenow.)

Ebner et Drenowskij, 1930, in Kirilov i Drenovski, Izv. Belgar. Ent. Druzh., V:108, tab. 2, Figures 3, 4 (Nocarodes), Ebner et Drenowskij, 1936, in: Kirilov i Drenovski, Izv. Belgar Ent. Druzh., IX 252, tab. 1, Figures 1-4 (Nocarodes).

13(10). Hind femur in both sexes with a red inner aspect. Mesosternum in the ♂ with a narrow space between the lobes; its narrowest part almost 1/2 of the narrowest part of one mesosternal lobe (Figure 746).

14(15). Vertex in both sexes strongly depressed, its margins sharp. Median carina of pronotum in the ♀ arcuate in profile. Hind tibia in both sexes with a red inner aspect. *7. P. rimansonae (Uv.)

a (b). Body in both sexes covered with sharp tubercles. Occiput in the ♀ nearly flat, with very distinct rugulae. Length ♂ 20.0-21.1, ♀ 32.5-45.0 mm; hind femur ♂ 9.1-10.0, ♀ 12.2-14.0 mm. —Georgia . . . . *7a. P. rimansonae rimansonae (Uv.)

—rimansonae Uvarov, 1918, Izvestiya Kavkazskogo muzeya, XII 58, Figures 10r, 13, 15 (legend below Figure 13 Nocarodes cyanipes F.-W.) (Nocarodes), Tarbinskii, 1940 34 (Nocaracris)

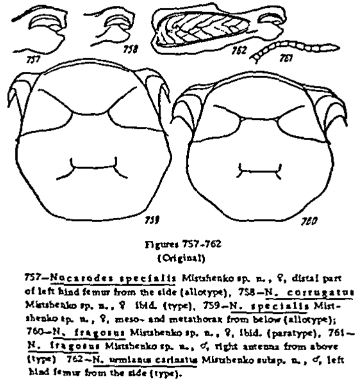
354 b (a). Body in the ♀ covered with greatly effaced tubercles. ♀ occiput convex, with slight rugulae. ♂ unknown. Length ♀ 29.3-37.7, hind femur 12.2-14.6 mm. —Georgia Svanetia . . . . *7b. P. rimansonae ventosus Mistshenko subsp. n.

15(14). ♀ vertex barely depressed, its margins hardly developed. Median carina of pronotum in the ♀ nearly straight in profile. Hind tibia in the ♀ with a yellow inner aspect. ♂ unknown. Length ♀ 37.8, hind femur 12.7 mm. —Northeastern Turkey village of Opiza porta in the Artvin region. . . . . 8. P. acinosus Mistshenko sp. n.

16 (1). Pronotum with strongly effaced lateral carinae and with a slightly developed median carina; its surface barely depressed at the sides of the median carina.

Figure 755. Savalania pulla Mistshenko gen. et sp. n., ♂ (paratype). (Original)

Figure 756. Nocarodes specialis Mistshenko sp. n., ♂ (paratype). (Original)



Figures 757-762
(Original)

757—Nocarodes specialis Mistshenko sp. n., ♀, distal part of left hind femur from the side (allotype). 758—N. corrugatus Mistshenko sp. n., ♀ ibid. (type). 759—N. specialis Mistshenko sp. n., ♀, meso- and metathorax from below (allotype); 760—N. fragosus Mistshenko sp. n., ♀, ibid. (paratype). 761—N. fragosus Mistshenko sp. n., ♂, right antenna from above (type). 762—N. urmianus carinatus Mistshenko subsp. n., ♂, left hind femur from the side (type).

17(18). Vertex in both sexes narrow, its width between the eyes in the ♂ nearly 2/3 of, but in the ♀ nearly equal to the vertical diameter of an eye (Figures 751, 752). Hind tibia in the ♂ with orange inner aspect, but in the ♀ whitish-yellow. Length ♂ 19.3-22.3, ♀ 35.3-40.6 mm, hind femur ♂ 9.2-9.6, ♀ 12.3-13.4 mm. —Northeastern Turkey· Koban-olor, Panzhuret, Gurzhany Pass, Tausker, Olor (Figure 734). . . . . 9. P. elegans Mistshenko sp. n.

18(17). Vertex in both sexes wide; its width between the eyes in the ♂ nearly equal to, but in the ♀ 1.5 times more than the vertical diameter of an eye (Figures 753, 754). Hind tibia in the ♂ with a red inner aspect, but in the ♀ it is dark blue-black. Length ♂ 21, ♀ 31.7-35.0 mm, hind femur ♂ 8.9-9.0, ♀ 11.3-14.1 mm. —Northeastern Turkey . . . . .10. P. tridentatus (Stshelk.)

Shchelkanovtsev, 1916, Izvestiya Kavkazskogo muzeya, X 4 (Nocarodes), Tarbinskii, 1940 34 (Nocaracris)

102. Genus Savalania Mistshenko gen n.

♂ fastigium bordered by a small ridge. No preocellar foveolae. Median carina of pronotum entire, not intersected by a transverse nor by a longitudinal groove. No tegmina or wings. Hind femur with only small teeth on the dorsal margin, dorsal lobe of femur slightly and uniformly developed along
355 the whole femur. Mesosternum with small scattered punctures, its lobes trapezoidal, ventral margin of a lobe is sharply bent at an angle, forming its inner margin Metasternum with small scattered punctation, its greatest width is equal to the length of the meso- and metathorax together, its anterior margin in the middle sharply bent twice at an angle, its median process strongly projecting into the region of the mesosternum. First abdominal tergite without tympanic organ.

Only one species, living in northwestern Iran, is known.

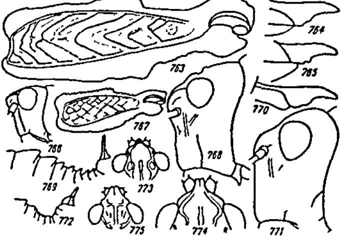
1 (1). Frontal ridge in the ♂ in profile slightly projecting forward in the dorsal part and with a distinct notch near the median ocellus. Pronotum in the ♂ with distinct lateral carinae in the anterior part, extending far beyond its middle. Hind tibia in the ♂ black. ♀ unknown Length ♂ 19.4-19.5, hind femur 7.9-8.3 mm —Northwestern Iran Savalan (Kutur-su) (Figure 755). 1. S. pulla Mistshenko sp n

103. Genus Nocarodes F.-W.

Fischer-Waldheim, 1846 228, 266 (partim) Brunner-Wattenwyl, 1882 86, 188 (partim); Jakobson 1905; 172, 200, 297 (partim), Tarbinskii, 1940 34, 213. —Vachushtia Shugurov, 1912, Russkoe entomologicheskoe obozrenie, XII, 1 105

Type of genus: Nocarodes serricollis F.-W.

In profile the frontal ridge slightly projects forward in the dorsal part. Fastigium bordered by a small ridge. No preocellar foveolae Pronotum slightly widened in the middle part, its greatest width equal to or distinctly less than its greatest length, its anterior part with distinct lateral carinae,



Figures 763-775
(Original)

763—Nocarodes urmianus carinatus Mistshenko subsp. n., ♀, left hind femur from the side (allotype), 764—N. fragosus Mistshenko sp. n., ♀, left ventral valve of ovipositor from the side (allotype), 765—N. urmianus carinatus Mistshenko subsp. n., ♀, ibid. (allotype), 766—N. specialis Mistshenko sp. n., ♂, head from the side (type); 667—N. specialis Mistshenko sp. n., ♂, left hind femur from the side (type); 768—N. urmianus carinatus Mistshenko subsp. n., ♀, head from the side (allotype), 769—N. urmianus carinatus Mistshenko subsp. n., ♂, dorsal part of abdomen from the side (type), 770—N. urmianus urmianus Rme., ♀, left ventral valve of ovipositor from the side (topotype); 771—N. specialis Mistshenko sp. n., ♀, head from the side (allotype); 772—N. specialis Mistshenko sp. n., ♂, dorsal part of abdomen from the side (type), 773—N. specialis Mistshenko sp. n., ♂, vertex from above (type), 774—N. specialis Mistshenko sp. n., ♀, ibid. (allotype); 775—N. fragosus Mistshenko sp. n., ♂, ibid. (type).

situated close to the median carina, median carina not intersected by a transverse groove and either entire in the middle or with a slight median longitudinal groove. No tegmina or wings. Hind femur usually finely sinuous on the dorsal margin, dorsal lobe of femur usually strongly developed in the basal part, forming a preapical notch, rarely in the ♂ the dorsal lobe is slightly developed and the preapical notch is not distinct. Prosternum with slightly-developed anterior margin, which has a sharp pointed median process. Mesosternum either with sparse scattered punctation or densely, coarsely punctate; its lobes are trapezoidal, ventral margin of a lobe sharply bent at an angle, *forming its inner margin. Metasternum* with sparse scattered punctation, sometimes densely and coarsely punctate, its anterior margin in the middle sharply bent twice at an angle, its median process strongly projecting into the region of the mesosternum. First abdominal tergite without tympanic organ.

There are 14 species known, distributed in the Caucasus, northwestern Turkey, and western Iran

1(24). Pronotum in both sexes strongly narrowed at the anterior margin, in the posterior part it has distinct lateral carinae, extending only to the middle of its lateral lobes.

2(23). Hind femur in both sexes with a slightly-developed dorsal margin on the genicular lobe, which is smooth or has very indistinct teeth (Figures 757, 758).

3(22). Hind tibia in both sexes with a black or a dark blue-black inner aspect.

4(15). Metasternum in both sexes with a wide space between the lobes, its
356 greatest width equal to or slightly greater than the narrowest part of the space between the lobes of the mesosternum (Figures 759, 760)

5(14). Antennae in the ♂ long, the greatest width of a single middle segment is equal to or distinctly less than its length (Figure 761). Hind femur in the ♂ with a distinct preapical notch on the dorsal margin, dorsal lobe of femur in the ♂ well developed, its greatest width is equal to the greatest width of the ventral lobe of the femur (Figure
357 762), *preapical notch of dorsal margin of the femur in the ♀ beginning far beyond the middle of the femur (Figure 763). ♀ ovipositor* without a tooth or with a rounded process at the base of the ventral valve (Figures 764, 765)

6(13) ♂ frontal ridge in profile distinctly projecting forward above the antennae, making a distinct angle with the fastigium. ♂ eyes oval (Figure 766). Metanotum and first abdominal tergite in both sexes with sharp lateral carinas. Hind femora in both sexes with sharp lateral carinae. Hind femur in both sexes with a distinct notch on the ventral margin and with a moderately developed ventral lobe, its greatest width occurs at the beginning of the distal third (Figure 767)

7 (8) ♀ eyes nearly round (Figure 768). ♂ abdomen with distinct lateral carinae on all the tergites, median carina of the last tergites in profile near the tip raised in the form of a pointed tubercle or spine (Figure 769) . . . . 1. N. urmianus Rme

a (b). Vertex in both sexes slightly depressed ♀ antennae stout, the length of 1 middle segment of the antenna is 1.5 times more than its greatest width Hind tibia in the ♂ with 8 spines on the outer margin

of the dorsal aspect. ♀ ovipositor with an indistinct process near the base of the ventral valves (Figure 770). Length of ♂ 22.0-24.9, ♀ 40.0-52.5 mm; hind femur ♂ 9.0-9.3, ♀ 13.5-14.0 mm. —Northwestern Iran, Iranian Azerbaijan: Danalu. . . . . 1a. N. urmianus urmianus Rme.

—urmiana Ramme, 1939, Mitt. Zool. Mus. Berlin, XXIV:135, tab. II, Figures 6a-b. —serricollis Tarbinskii, 1940:34, 213 (partim).

b (a). Vertex greatly depressed in both sexes. ♀ antennae more slender; length of 1 middle antennal segment 2.5-3 times more than its greatest width. Hind tibias in the ♂ with 9 spines on the outer margin of the dorsal aspect. ♀ ovipositor with a distinct rounded process near the base of the ventral valves (Figure 765). Length ♂ 21.6, ♀ 59.2 mm; hind femur ♂ 9.6, ♀ 16.8 mm. —Northwestern Iran, Iranian Azerbaijan: Neichalon, Nuzluchai (type locality). . . . . 1b. N. urmianus carinatus Mistshenko subsp. n.

—serricollis Tarbinskii, 1940:34, 213 (partim).

8 (7). ♀ eyes oval (Figure 771). Last tergites of abdomen in the ♂ without lateral carinae; their median carina in profile straight, not forming a pointed tubercle or spine on the apex (Figure 772).

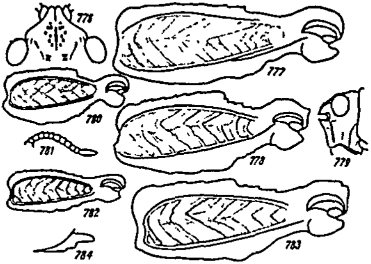
9 (10). ♂ vertex wide and short with obtuse-angular fastigium; its greatest width nearly equal to its length, measured from its fastigium to the beginning of its narrow posterior part (Figure 773); lateral margins of vertex in the ♀ medially sharply convergent toward the median carina (Figure 774). Length ♂ 17.7-22.8, ♀ 34.3-51.8, hind femur ♂ 7.9-9.1, ♀ 12.7-15.7 mm. —Northern Iran: Teheran, Semnan. (Type from Teheran) (Figure 756) 2. N. specialis Mistshenko sp. n.

10 (9). ♂ vertex narrow and long, with an acute-angled apex; its greatest width nearly 1/2 its length, measured from its apex to the beginning of its narrow posterior part (Figure 775); lateral margins of ♀ vertex medially parallel to each other or effaced. (Figure 776).

11 (12). Hind femur in both sexes with slightly developed dorsal and ventral lobes; lobes barely raised before the emargination [or notch]; ♀ femur 4 times longer than its greatest width (Figure 777). ♀ vertex wide. Prosternum in both sexes with a distinct median process on the anterior margin. Length ♂ 20.5-22.6, ♀ 36.4-48.5 mm; hind femur ♂ 7.6-10.1, ♀ 13.3-15.6 mm. —Armenia: Mt. Aragats, Erevan; Na-
358 khichevan A.S.S.R. · Nakhichevan, Ordubat, Dzhuga, Djulfa, Beladtu, villages of Negram, Paraga, Bist, Chananab, Disar. (Type from Ordubat) . . . . *3. N. fragosus Mistshenko sp. n.

—serricollis Tarbinskii, 1940:34, 213 (partim).

12 (11). Hind femur in the ♀ with strongly developed dorsal and ventral lobes; the lobes strongly raised before the notch; length of ♀ femur 3.5 times more than its greatest width (Figure 778). ♀ antennae



Figures 776-784
(Original)

776—*Nocarodes fragosus* Mistshenko sp. n., ♀, vertex from above (allotype), 777—*N. fragosus* Mistshenko sp. n., ♀, left hind femur from the side (allotype), 778—*N. aserbus* Mistshenko sp. n., ♀, ibid. (type), 779—*N. nodosus* Mistshenko sp. n., ♂, head from the side (type), 780—*N. nodosus* Mistshenko sp. n., ♂, left hind femur from the side (type), 781—*N. scabiosus Mistshenko sp. n.*, ♂, right antenna from above (type), 782—*N. scabiosus* Mistshenko sp. n., ♂, left hind femur from the side (type), 783—*N. scabiosus* Mistshenko sp. n., ♀, ibid. (allotype), 784—*N. scabiosus* Mistshenko sp. n., ♀, left ventral valve of ovipositor from the side (allotype).

short, far from reaching the middle of the lateral lobes *of pronotum*. ♀ pronotum with two notches in the posterior margin, Mesosternum in the ♀ with a narrow space between the lobes; its narrowest part distinctly less than the narrowest part *of a mesosternal* lobe. ♂ unknown. Length ♀ 37.2, hind femur 12.4 mm. —Northeastern Turkey: Van . . . . 4. N. aserbus *Mistshenko sp. n.*

13 (6). Frontal ridge in the ♂ in profile not projecting forward above the antennae, rounded. ♂ eyes nearly round (Figure 779). Metanotum and first abdominal tergite in the ♂ *with strongly effaced lateral*
359 carinae. Hind femur in the ♂ without notch on the ventral margin but with strongly developed ventral lobe; its greatest width is near the middle of the femur (Figure 780). ♀ unknown. Length ♂ 19.2, hind femur 7.9 mm. —Armenia: Kulpi . . . . *5. N. nodosus *Mistshenko sp. n.*

14 (5). ♂ antennae short; greatest width of a single middle segment considerably more than its length (Figure 781). Hind femur in the ♂ with a barely visible notch on the dorsal margin; dorsal lobe of femur in the ♂ slightly developed; its greatest width distinctly less than the greatest width of its ventral lobe (Figure 782); preapical notch of dorsal margin in the ♀ found in the middle of the femur (Figure 783). ♀ ovipositor with distinct pointed tooth near the base of the ventral valve (Figure 784). Length ♂ 18.1, ♀ 37.8, mm; hind femur ♂ 7.5, ♀ 14.2mm. —Iran, Iranian Azerbaijan: Tabriz . . . . 6. N. scabiosus *Mistshenko sp. n.*

—serricollis Tarbinskii, 1940:34, 213 (partim).

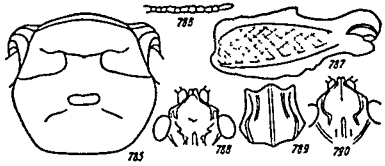
15 (4). *Metasternum in both sexes with a moderately wide space between the* lobes; its greatest width considerably less than the narrowest part of the space between the mesosternal lobes (Figure 785).

360 16 (19). ♂ antennae long and slender; length of a single middle segment of the antenna distinctly greater than its greatest width (Figure 786). ♀ pronotum with an entire median carina without a median longitudinal groove.

17 (18). Pronotum in the ♀ *with slightly raised* median carina and usually distinctly swollen (or bulging) near the median carina in the middle part; lateral carinae in both sexes anteriorly weak. ♀ metanotum with a weak median carina. Hind femur in both sexes with a sharp notch on the dorsal margin; dorsal lobe well developed before the notch (Figure 787). . . . . *7. N. serricollis F.-W.

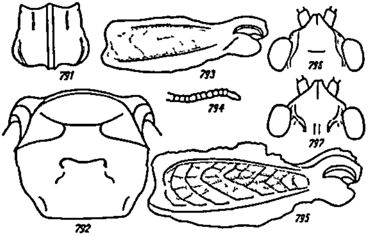
a (d). Occiput in both sexes with distinct rugulae. Mesosternal lobes in both sexes wide; the greatest width of a lobe is considerably more than its length (Figure 785).

b (c). ♀ vertex narrower; its width between the eyes nearly equal to the vertical diameter of the eye. ♂ pronotum narrow; its greatest width between the lateral carinae distinctly less than its length (Figure 789). Length ♂ 15.6-18.8, ♀ 36.8-40.4, *hind femur* ♂ 6.5-7.2, ♀ 9.5-12.3 mm. —Azerbaijan. (Figure 788). . . . . *7a. N. serricollis serricollis F.-W.



Figures 785-790
(Original)

785—N. serricollis serricollis F.-W., ♀, meso- and metathorax from below, 786—N serricollis serricollis F.-W , ♂, right antenna from above, 787—N. serricollis serricollis F.-W., ♀, left hind femur from the side, 788—N serricollis serricollis F -W., ♀, vertex from above, 789— N. serricollis serricollis F.-W., ♂, pronotum from above, 790—N. serricollis sancti-davidi (Shug.), ♀, vertex from above.



Figures 791-797
(Original)

791—Nocarodes serricollis sancti-davidi (Shug), ♂, pronotum from above, 792—N. sericollis loripes Mistshenko subsp. n., ♀, meso- and metathorax from below (type), 793—N. nanus Mistshenko sp. n., ♀, left hind femur from the side (type) 794—N. geniculatus Uv., ♂, right antenna from above (type), 795—N. crispus Mistshenko sp. n., ♀, left hind femur from the side (type), 796—N humerosus Mistshenko sp. n , ♀, vertex from above (type), 797—N. gibbosus Mistshenko sp. n., ♀, ibid (type).

—serricollis Fischer-Waldheim, 1846.268, tab. XXXI, Figure 1; Brunner-Wattenwyl, 1882:189, 191; Jakobson, 1905:200, 298 (partim); Tarbinskii, 1940:34, 213 (partim).

c (b). ♀ vertex wide; its width between the eyes considerably greater than the vertical diameter of the eye. ♂ pronotum wide; its greatest width between the lateral carinae equal to its length (Figure 791). Length ♂ 16.4-19.5, ♀ 28.0-30.3, hind femur ♂ 7.2-8.5, ♀ 11.4-11.8 mm. —Georgia. (Figure 790) . . . . *7b. N. serricollis sancti-davidi (Shug.)

—sancti-davidi Shugurov, 1912, Russkoe entomologicheskoe obozrenie, XII, 1:105 (Vachushtia). —serricollis Tarbinskii, 1940:34, 213 (partim).

361 d (a). ♀ occiput with effaced rugulae. Mesosternal lobes in the ♀ moderately wide; the greatest width of a lobe is equal to its length (Figure 792). ♂ unknown. Length ♀ 38.5-46.5, of hind femur 11.7-13.2 mm. —Dagestan: Salatau Range . . . . *7c. N. serricollis loripes Mistshenko subsp. n.

18 (17). ♀ pronotum with strongly raised median carina but not swollen in the median part; lateral carinae in the ♀ distinct in the anterior part; ♀ metanotum with a distinct median carina. Hind femur in the ♀ with a very slight emargination on the dorsal margin; dorsal lobe barely developed before the emargination (Figure 793). ♂ unknown. Length of ♀ 25.5-35.4, hind femur 10.9-11.9 mm. —Southwestern Azerbaijan: Bartaz Pass in the Araks; northwestern Iran, Hassan-Beglyu, Karadag Range (Type from Bartaz Pass). . . . . *8. N. nanus Mistshenko sp. n.

19 (16). ♂ antennae short and stout; the length of a single antennal middle segment 1/2-2/3 its greatest width (Figure 794). ♀ pronotum with a median carina intersected by a distinct narrow median longitudinal groove [the word 'intersected' has until now been used when the groove is transverse; it seems to be a misprint for the word 'cleft' which has until now been used when the groove concerned is longitudinal].

20 (21). Vertex in both sexes greatly depressed. Pronotum in both sexes with a narrow median carina; its surface is greatly depressed on the sides of the median carina. Hind femur in both sexes with a black ventral aspect. Length ♂ 16.0-16.6, ♀ 31.2-32.0 mm; hind femur ♂ 7.5-7.7, ♀ 10.8-11.0 mm. —Dagestan. . . . . *9. N. geniculatus Uv.

—daghestanicus geniculatus Uvarov, 1928, Russkoe entomologicheskoe obozrenie, XXII, 3-4:154, Figure 2C, Tarbinskii, 1940:34.

362 21 (20). ♀ vertex flat. ♀ pronotum with a wide median carina; its surface swollen on the sides of the middle carina. Hind femur in the ♀ with a light ventral aspect. ♂ unknown. Length ♀ 28.5-37.5, hind femur 10.3-12.5 mm. —Iran; Gilyan: Molla-ali, Kara-rud Gorge, Rustemabad. (Type from the village of Molla-ali). . . . . 10. N. corrugatus Mistshenko sp. n.

22 (3). Hind tibia in both sexes with orange inner aspect. Vertex in both sexes strongly depressed. Pronotum in both sexes with an entire

median carina. Hind femur in both sexes with a black ventral aspect. Length ♂ 21.0-21.6, ♀ 33.4-36.0 mm; hind femur ♂ 9.1-9.5, ♀ 10.6-11.0 mm. —Dagestan Levashi. . . . . *11. N. daghestanicus Uv.

Uvarov, 1928, Russkoe entomologicheskoe obozrenie, XXII, 3-4:153, Figure 2D, Tarbinskii, 1940 34

23 (2). Hind femur in the ♀ with a strongly-developed dorsal margin on the genicular lobe, the margin supplied with sharp teeth (Figure 795). ♀ vertex strongly depressed. ♀ pronotum with an entire median carina. Hind femur in the ♀ with a black ventral aspect. Hind tibia in the ♀ black. ♂ unknown. Length of ♀ 36.6-45.3, hind femur 13.5-13.7 mm.—Iran, Iranian Azerbaijan Maragheh . . . . 12. N. crispus Mistshenko sp. n.

—serricollis Tarbinskii, 1940 34, 213 (partim).

24 (1). ♀ pronotum slightly narrowed at the anterior margin; lateral carinae of the posterior part in the form of a swollen pad obliquely traversing its lateral lobes from the posterior to the anterior margin.

25 (26). Frontal ridge in the ♀ greatly depressed, being distinctly widened in the dorsal part toward the median ocellus, in the ventral part it is sharp. ♀ vertex narrow, strongly depressed, its greatest width nearly equal to the vertical diameter of the eye (Figure 796) ♀ pronotum with strongly developed dorsal part, almost reaching the vertex. ♂ unknown. Length ♀ 39.5-41.8, of hind femur 12.8-13.6 mm. —Western Iran village of Malyat-abad, Kum and village of Khodzhib. (Type from village of Malyat-abad in Faragan) . . . . 13. N. humerosus Mistshenko sp. n.

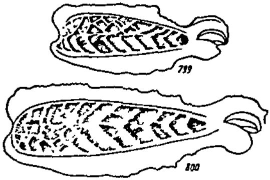
26 (25). Frontal ridge in the ♀ depressed in the dorsal part, almost parallel, effaced in the ventral part. ♀ vertex wide, flat, its greatest width 1.5 times more than the vertical diameter of the eye (Figure 797). ♀ pronotum with slightly developed dorsal part, far from reaching the vertex. ♂ unknown. Length of ♀ 53.2, of hind femur 14.6 mm. —Western Iran, Faragan village of Shakhbag. . . . . 14. N. gibbosus Mistshenko sp. n.

104. Genus Bufonocarodes Mistshenko gen. n

Type of genus: Bufonocarodes robustus Mistshenko gen. et sp. n.

Frontal ridge in profile slightly projecting forward in the dorsal part. Fastigium bordered by a small ridge. No preocellar foveolae. Pronotum strongly widened in the middle part, its greatest width considerably more than its greatest length, its anterior part without lateral carinae near the median carina, median carina not intersected [sic] by a transverse groove and either entire in the middle or with a weak median longitudinal groove.
363 No tegmina or wings. Hind femur fine and sinuous on the dorsal margin,

Figure 798. Bufonocarodes tumulosus Mistshenko gen. et sp. n., ♂ (paratype). (Original)



Figures 799-800
(Original)

799—Bufonocarodes tumulosus Mistshenko gen. et sp. n., ♀, left hind femur from the side (allotype), 800—B. robusta Mistshenko gen. et sp. n., ♀, ibid. (allotype).

dorsal lobe of femur strongly developed in the basal part, making a distinct preapical notch [or emargination, etc.]. Prosternum with slightly developed anterior margin which has a distinct pointed median process. Mesosternum either with sparse scattered punctation, or densely and coarsely punctate, its lobes trapezoidal; ventral margin of the lobes distinctly bent at an angle forming the inner lateral margin. Metasternum either with sparse scattered punctation, or sometimes densely and coarsely punctate; its anterior margin in the middle twice sharply bent at an angle; its median process strongly depressed in the region of the mesosternum. First abdominal tergite without the tympanic organ.

Three species, distributed in Azerbaijan and in western Iran, are known.

364 1 (4). Pro- and metanotum of the ♀ with a median carina intersected [sic] by a narrow but distinct median longitudinal groove. Hind tibias in both sexes with a dark blue-black inner aspect.

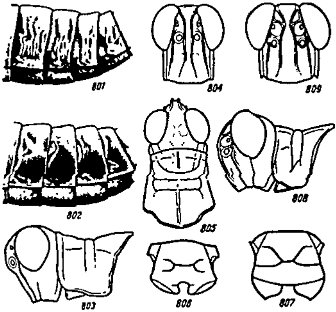
2 (3). ♀ vertex strongly depressed, with distinct tubercles and rugulae. Metanotum and the first 2 abdominal tergites in the ♂ with a distinct median carina and with distinct lateral carinae; median carina in profile weakly comb-like. Hind femur in the ♀ with a deep emargination before the distal end of the dorsal margin (Figure 799). Length ♂ 17.3-20.2, ♀30.4-39.4 mm, hind femur ♂ 7.2-8.2, ♀ 11.3-13.4 mm. —Azerbaijan· Govdara, Gelyadara, Kosmol'yan, Barnasar, Kyalvyaz, Everi. (Type from Barnasar). (Figure 798)........ ....*1. B. tumulosus Mistshenko sp. n.

3 (2). ♀ vertex slightly depressed, tubercles obliterated, no rugulae. Metanotum and first 2 abdominal tergites in the ♂ with median carina effaced and with lateral carinae effaced, median carina in profile hardly raised in the posterior part. Hind femur in the ♀ with a shallow preapical notch [or emargination] on the dorsal margin (Figure 800) Length ♂ 22.8, ♀ 45.9-65.6 mm, hind femur ♂ 9.2, ♀ 16.5-17.5 mm. —Western Iran Faragan, Asterabad (Type from Faragan) [Figure on preceding page = B. robusta n sp] .... 2. B. robustus Mistshenko sp. n

4 (1). Pro- and metanotum in the ♀ with an entire median carina without a median longitudinal groove. Hind tibia in the ♀ with a violet-black inner aspect. ♂ unknown. Length ♀ 38.5, hind femur 15.4 mm — Western Iran, Fars Kharadzhi.. ... .3. B intricatus Mistshenko sp. n.

105. Genus Iranacris Mistshenko gen. n.

♀ frontal ridge in profile strongly projecting forward in the dorsal part Fastigium bordered by a small ridge. No preocellar foveolae. Pronotum with a median carina not intersected by a transverse groove but with a distinct median longitudinal groove. No tegmina or wings Hind femur fine and sinuous on the dorsal margin, dorsal lobe of femur strongly developed in the basal part, making a distinct preapical emargination. Prosternum with strongly developed anterior margin, this being strongly raised in the form of a semicircular little collar. Mesosternum with small scattered punctation; its lobes nearly trapezoidal, ventral margin of a lobe sharply bent at an angle, forming its inner margin Small scattered punctation on metasternum,



Figures 801-809
(Original)

801—Egnatioides desertus Uv., ♂, lateral aspect of abdomen; 802—Charora crassivenosa Sauss., ♂, ibid.; 803—Egnatioides desertus Uv., ♂, head and pronotum from the side (Kzyl-Orda), 804—E. desertus Uv., ♂, head, front view (Kzyl-Orda), 805—E. desertus Uv., ♂, head and pronotum from above (Kzyl-Orda), 806—E. coerulans B.-Bienko sp. n., ♀, meso- and metasternum (type), 807—E. sphaerifer B.-Bienko sp. n., ♂, ibid. (paratype, central Khorasan), 808—Egnatius apicalis Br.-W., ♂, head and pronotum from the side (topotype, Krasnoarmeisk), 809—E. apicalis Br.-W., ♂, head, front view (topotype, Krasnoarmeisk)

its anterior margin in the middle twice sharply bent at an angle, its median process strongly projecting into the region of the mesosternum. First abdominal tergite without the tympanic organ.

Only one species, living in western Iran, is known.

1 (1). ♀ body with very distinct tubercles and rugulae. ♀ vertex very greatly depressed. Middle femur in the ♀ with sinuous dorsal and ventral margins. Hind femur in the ♀ with sharply dentate ventral margin, ventral aspect of femur black. Hind tibia in the ♀ with black inner aspect. ♂ unknown. Length of ♀ 52.2, hind femur 15.8 mm. —Western Iran Faragan. . . . . 1. I. dentatus Mistshenko sp. n.

4. Subfamily EGNATIINAE

(Compiled by G. Ya. Bei-Bienko)

Body small. Antennae with segments slightly thickened in the apical
365 part or indistinctly clavate Head (Figures 803, 808, 810) with weakly sloping or perpendicular front, eyes large, round, foveolae either developed and then round or triangular, or indistinct. Pronotum (Figures 803, 805, 808, 810, 812-814) short, a transverse groove often situated in the region of the middle. Prosternum between the bases of the forelegs swollen, but without a process, transverse groove of mesosternum in the middle strongly concave caudad between the lateral lobes (Figures 98, 806, 807). Empodium between the claws of the tarsi very small, indistinct, hind femur rather stout, externally with pinnately arranged regular areas, inner spines of hind tibia shorter than the spines of the outer row, outer apical spine always absent. Tegmina, if developed, usually with the median field open, the spurious median vein often weak or obsolescent, not granular. Sides of ♂ abdomen in most genera with vertical rugulae (Figures 801, 802).

This subfamily, consisting of a total of 5 genera, is restricted in distribution to the deserts of the Old World from Dzungaria, Kazakhstan, and the Lower Volga Region to North Africa, most of the genera and species are peculiar to Iran, but one species is known from Asia Minor.

Earlier authors considered this subfamily only as a group of the Oedipodinae. However, the anatomical characteristics and also the structure of the mesosternum, the slightly developed median spurious vein of the tegmina and the usually open median field sharply differentiate this group from real Oedipodinae. The last two characters bring the Egnatiinae close to the subfamily Catantopinae, this similarity is strengthened by the fact that the most characteristic feature of Egnatiinae—the posterior concave transverse groove of the mesosternum—is distinctly marked in the Iranian genus Farsinella B -Bienko belonging to the Catantopinae and nearest of all to Dericorys Serv. Moreover, the Egnatiinae [sic!], as in the case of the Catantopinae, have glandular sac-like formations on the sides of the genital cavity in the ♀. Hence, according to these characters, the Egnatiinae [sic!] is most closely related to the subfamily Catantopinae and can be considered as a specialized desert group, related to the said subfamily (cf. also page 74 of the text).

All 5 known genera of the subfamily are cited below.

1 (8). *Pronotum* with a distinct median carina in the prozona (Figures 805, 812-814, 816). Sides of fourth to the eighth abdominal segments in the ♂ with vertical rugulae (Figures 801, 802), sometimes not distinct but visible.

2 (7). Tegmina and wings completely developed or a little shortened, but not lateral. Metazona of pronotum not shorter or barely shorter than the prozona (Figures 803, 805, 808, 810, 812, 813, 816).

3 (6). Tegmina narrow; wings normal. Pronotum without lateral carinae, or the carinae are present only in the anterior part of the prozona (Figure 805). Sides of fourth to eighth abdominal tergites in the ♂ *with irregular wide rugulae* (Figure 801).

4 (5). Antennae shorter, not clavate in the ♂ and not more than 1.5 times longer than the head with the pronotum, in the ♀ hardly longer than they are. Frontal ridge in profile projecting forward between the *antennae* (Figure 803). Lateral *facial carinae*, when the head is examined from in front, gradually taper upward and are not sharply curved around the antennal sockets (Figure 804) . . . . 106. Egnatioides Voss.

366 5 (4). Antennae very long, in the ♂ moderately clavate, twice as long as the head with the pronotum, in the ♀ 1.5 times longer. Frontal ridge in profile not projecting forward between the antennae (Figure 808). Lateral facial carinae, when the head is examined from in front, completely parallel in the ventral part and strongly curved in an S-shape near the antennal sockets (Figure 809). . . . . .107. Egnatius Stål.

6 (3). Tegmina wide, wings with veins thickened near the anterior margin and with a very wide field along the posterior margin of the anterior lobe (Figures 811, 815), in the ♂ they are dark. Pronotum with sharp lateral carinae in the metazona (*Figures 812, 813, 816*). *Sides* of the fourth to the eight abdominal segments in the ♂ with many thin regular rugulae (Figure 802) . . . . .108. Charora Sauss.

367 7 (2). Tegmina greatly abbreviated, small, perfectly lateral; no wings. Metazona of pronotum considerably shorter than the prozona (Figure 814) . . . . 109. Paregnatius Uv.

8 (1). Pronotum without a median carina in the prozona. Lateral aspects of ♂ abdomen smooth, without vertical rugulae. Head dorsally *smooth, without rugulae or ridges. Tegmina* and wings completely developed . . . . 110. Leptoscirtus Sauss.

106. Genus Egnatioides Voss.

Vosseler, 1902, Zool. Jahrb. Syst., XVI 361. Uvarov, 1927a:245.
Type of genus: *E. striatus* Voss., Algiers.

Antennae not clavate, in the ♂ not more than 1.5 times, in the ♀ hardly longer than the head with the pronotum. Head *moderately projecting above* the pronotum or, in the ♀, not projecting at all; frons distinctly sloping, frontal ridge in profile projecting forward between the antennae (Figure

803); lateral facial carinae when the head is examined from in front, not at all or at least not in the ventral part, parallel, but converging dorsad, not sharply bent at the dorsal end (Figure 804); apex [or top] of head with at least slight little ridges and rugulae; vertex narrow, not very strongly sloping, its width when seen from the top considerably narrower than the adjacent part of the eye; foveolae well marked. Pronotum (Figure 805) with a median carina in the prozona; lateral carinae in the metazona absent but at least slightly developed in the anterior part of the prozona. Lateral lobes longer than high (Figure 803), more rarely slightly higher than long. Tegmina narrow, long, without vena spuria in the cubital field. Wings not darkened, with normal venation. ♂ abdomen on the sides of the fourth to the eighth segments with rather irregular, not very thin, vertical rugulae (Figure 801).

Five species are known of which 2 are distributed in the Sahara, the rest in Iran and Central Asia; 2 additional new species are described below. All species, except the African, are included in the key.

1 (8). Prosternum between the front legs slightly swollen; the swelling itself does not have a regularly globular form, its anterior margin is truncate, nearly perpendicular. Transverse groove of prosternum in the middle less concave behind and here significantly far from reaching the line of the posterior margins of the lateral lobes, therefore the space between the lateral lobes is distinctly marked, quadrangular (Figures 98, 806).

2 (3). Frontal ridge between the antennae flat, slightly widened. Space between the lateral lobes of mesosternum transversely rectangular, hardly widened caudad, transverse groove between the lobes situated closer to the anterior boundary of the lobes than to the posterior (Figure 806). Pronotum short, with obtuse-angled posterior margin, transverse groove situated in the middle, height of lateral lobes hardly greater than their length. Wings dark blue. Ventral valves of ♀ ovipositor with a small roundly blunted tooth. Length ♀ 13.0-14.8, tegmina 11.3-13.0 mm; ♂ unknown.—Iran Kerman and Iranian Baluchistan (type ♀, Purra eastward from Bampur) . . . . 1. E. coerulans B.-Bienko sp. n.

368 3 (2). Frontal ridge between the antennae with a groove extending onto the vertex. Space between the lateral lobes of the mesosternum distinctly widened caudad, transverse groove between the lobes situated in their middle (Figure 98).

4 (5). Posterior margin of pronotum distinctly roundly obtuse-angled. Eyes large (Figure 810); their vertical diameter in the ♂ twice, in the ♀ 1.5 times more than the length of the subocular groove. Lateral lobes of pronotum of the same length and height (Figure 810) Tegmina without a distinct vena spuria in the median field. Hind tibiae grayish. Length ♂ 12, ♀ 15 mm, tegmina ♂ 10-11, ♀ 13.5 mm. —Iran Farsistan . . . . 2. E. farsistanicus Uv.

Uvarov, 1933, Trudy Zoologicheskogo instituta AN SSSR, (1932), I 207, Figure 7.

5 (4). Posterior margin of pronotum more rounded, indistinctly obtuse-angled (Figure 805). Eyes of moderate size, in the ♂ less than twice the subocular groove (Figure 803), in the ♀ equal to it.

6 (7). More thickset. *Tegmina extending slightly beyond the distal end of the hind femora or, in the ♀, often only reaching it.* Groove in the dorsal part of the frontal ridge not deep, in the ♀ often slightly marked. Pronotum with distinct transverse grooves, the areas between them convex (seen in profile!); lateral lobes of pronotum even in the ♂ not longer than their own height. Length ♂ 11.3-12.5, ♀ 13.5-15.5 mm; tegmina ♂ 9.5-10.5, ♀ 10.5-12.0 mm. —North Iran: Shahrud, Khorasan (!). . . . . 3. E. kiritshenkoi Uv.

Uvarov, 1933, Trudy Zoologicheskogo Instituta AN SSSR, (1932), I 206, Figure 6.

7 (6). More slender. Tegmina extending beyond the distal end of the hind femora, often for nearly the length of the pronotum. *Groove in the dorsal part of the frontal ridge sharp, deep.* Pronotum with slight transverse grooves, the areas between them not convex; lateral lobes at least in the ♂ longer than their height (Figure 803) . . . . 4. E. desertus Uv.

a(b). Transverse groove of pronotum *in the ♂ situated in the middle;* lateral lobes even in the ♀ at least somewhat longer than high. Frontal ridge in profile strongly projecting forward between the eyes (Figure 803). Wings colorless, with slightly or moderately darkened longitudinal veins. Length ♂ 12.0-12.8, ♀ 12.5-15.5 mm; tegmina ♂ 9.8-10.8, ♀ 10.2-13.3 mm. —Kazakhstan: *delta of the Ural, Aral* Kara Kum (!), Syr Darya lowland from Kzyl-Orda to Turkestan, Turkmenia (!). (Figures 98, 801, 804, 805) . . . . *4a. E. desertus desertus Uv.

Uvarov, 1926, *Eos*, II:355; 1927a:146, Figure 169.

b(a). Transverse groove situated in the ♂ behind the middle of the pronotum; lateral lobes in the ♀ not longer than high, in the ♂ only slightly longer than high. Frontal ridge only slightly projecting forward between the eyes, making a wide regular arc with the vertex (only in a form transitional to the preceding subspecies, sometimes distinctly projecting between the eyes). Wings barely bluish, with black longitudinal veins. Length ♂ 11.0-12.5, ♀ 16.5 mm; tegmina ♂ 8.4-10.5, ♀ 12 mm. —Southeastern Kazakhstan: valley of the Ili; Uzbekistan: Golodnaya Steppe (!) . . . . *4b. E. desertus iliensis B.-Bienko.

Bei-Bienko, 1948, Izvestiya AN Kazakhskoi SSR, seriya zoologicheskaya, 8:192.

369 8 (1). Prosternum between the front legs strongly hemispherically swollen, especially in the ♂. Transverse groove of the mesosternum in the middle very strongly concave behind —*almost to the line of the posterior margin of the lateral lobes* (Figure 807), therefore the space between the lateral lobes behind the transverse groove is scarcely marked, but the lateral lobes themselves have the form of acute-angled platelets turned toward each other. Frontal ridge around the

median ocellus with a slight, nearly obsolescent groove. Wings colorless. Lateral lobes of pronotum not longer or hardly longer than high. Length ♂ 10.5-13.0, ♀ 13-17 mm; tegmina ♂ 10-11, ♀ 11.5-14.0 mm. —Iran Semnan, Shahrud, Khorasan (type ♀, Gul'-mirun) and Seistan . . . . .5. E. sphaerifer B.-Bienko sp. n.

107. Genus Egnatius Stål

Stål, 1876, Bih. Svensk. Akad Handl., IV, 5 25, Jakobson, 1905 271, Uvarov, 1927a 144

Like Egnatioides Voss., but the antennae are long, in the ♂ twice, in the ♀ 1.5 times as long as the head with the pronotum, not sharply clavate at the apex in the ♂ and only slightly widened in the ♀; middle segments 3-4 times longer than wide. Head (Figure 808) large, in the ♂ strongly projecting above the pronotum, frons in the ♂ moderately sloping, in the ♀ nearly perpendicular, frontal ridge in profile even in the ♂ hardly projecting forward between the bases of the antennae; lateral facial carinae when the head is examined from the front, parallel in the ventral part, sharply curved in an S-shape around the antennal sockets, and then inward (Figure 809), vertex wide, strongly sloping, of the same width as the adjacent part of the eye (seen from above.). Pronotum short, the lateral lobes higher than long (Figure 808), especially in the ♂. Prosternum rather strongly semiglobularly swollen between the front legs. Sides of abdomen in the ♂ with slightly vertical rugulae.

One species, which is variable in size and coloring, is known.

1 (1). Antennae apically black and, at least in the ♂, with a light tip Tegmina not extending or hardly extending beyond the hind genua. Hind femur light on the inside with a wide black band before the middle and a narrower one behind the middle, both bands extend over the dorsal aspect of the femur; the more anterior of them there makes a dark triangular spot. Length ♂ 10.5-12.5, ♀ 12.5-16 0 mm, tegmina ♂ 8.0-10.2, ♀ 9.8-12.5 mm. —Lower Volga Region north to Stalingrad†, southern part of Kazakhstan east to Semipalatinsk and Zaisan depression, Middle Asia except high mountains, northern Iran, Dzungaria Predominantly gravelly deserts . . . . . .*1. E. apicalis Stål

Stål, 1876, (cited publications) 25, Brunner-Wattenwyl, 1882 158, tab V, Figure 35 Jakobson, 1905: 271, Uvarov, 1927a 145, Figure 168

108. Genus Charora Sauss.

Saussure, 1888 23, 71, Jakobson, 1905 271, Uvarov, 1927a 146
Type of genus Ch crassivenosa Sauss.

Antennae of moderate length, slightly thickened toward the apex, but not clavate. Head (Figures 812, 813, 816) rough, slightly projecting above the

† [Now Volgograd]

pronotum, frons in the ♂ slightly sloping, in the ♀ perpendicular, frontal ridge with a distinct groove; foveolae large, distinct. Pronotum (Figures 812, 813, 816) with distinct lateral carinae which are interrupted before the middle, in the anterior part of prozona with a sharp slightly raised median carina; posterior margin projecting at an angle. Tegmina (Figures 811, 815) rather wide, with vena spuria in the cubital field. Wings wide, specialized, with veins thickened along the anterior margin and greatly widened cubital field, with regular cross veins in it; darkened in the ♂. Hind femur stout, inner spines of the hind tibia in the distal part of the latter shortened and slightly flattened. Abdomen in the ♂ on the sides of the fourth to the eighth segments with numerous thin regular vertical rugulae, together making sections [or areas, platforms, terraces, squares, etc.] (Figure 802). ♀ ovipositor with rather stout valves which are curved on the apex like a hook.

A total of 5 species, one of which is known from Asia Minor, and the rest from Iran. All known species are found in the key.

1 (2). The rugose sections on the sides of the ♂ abdomen are dark, often black (Figure 802). ♀ tegmina somewhat shortened, not reaching the hind genua. Frontal ridge at the fastigium almost not narrowed. Fastigium transverse in front of the transverse interocular ridge. Lateral lobes of pronotum with oblique carinae. Length ♂ 13.5, ♀ 15 mm; tegmina ♂ 12, ♀ 8 mm. —Northern Iran: Elburz . . . . 1. Ch. crassivenosa Sauss.

Saussure, 1888:71; Jakobson, 1905:271; Uvarov, 1927a:146.

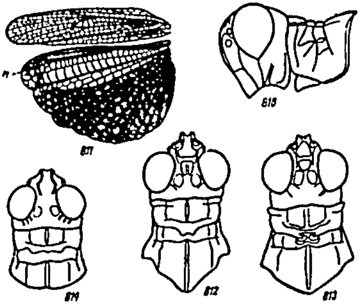
2 (1). Rugose sections on the sides of the ♂ abdomen not black, of the same color as the abdomen itself. ♀ tegmina reaching the hind genua or still longer.

3 (6). More thickset. ♂ tegmina wider, not more than 5 times longer than wide (Figure 811). ♂ wings only 1.5 times longer than wide, with not only the outer and anterior margins, but also frequently the base darkened; cells in the widened cubital field slightly shorter than their diameter, i.e., they are transverse (Figure 811). Frontal ridge not narrowed at the fastigium itself.

4 (5). *Tegmina extending beyond the hind genua almost or entirely for a length* equivalent to the whole length of the pronotum. Vertexal shield transverse, especially in the ♀, with concave lateral margins above the foveolae at least in the ♂ (Figure 812). Frontal ridge with moderately diverging margins under the ocellus. Lateral carinae of pronotum less distinct, not complete before the anterior transverse groove, tuberculose . . . . 2. Ch. persa Uv.

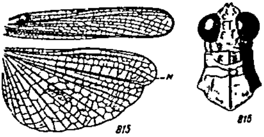
a(d). Frontal ridge narrow, with a deep groove. Pronotum in the prozona with slight tubercles or almost without them, in the metazona smooth, the posterior margin wholly (Figure 812) or in the ♀ almost right-angled.

b(c). Tegmina longer, extending beyond the hind genua in the ♂ farther than the width of the hind femurs, in the ♀ for not less than that width. M of the hind wings separated from the thickened veins for a distance greater than its own thickness. Length ♂ 14.5-15.0, ♀ 17-18 mm; tegmina ♂ 14.0-14.5, ♀ 15-16 mm. —Northern Iran:



Figures 810-814
(Figures 812-814 according to Uvarov, the rest original)

810—Egnatioides farsistanicus Uv., ♂, head and pronotum from the side, 811—Charora persa similis B.-Bienko subsp. n., ♂, left tegmen and wing (M - median vein), 812—Ch. persa Uv., ♂, head and pronotum from above, 813—Ch. kurda Uv., ♂, ibid., 814—Paregnatius moritzi Uv., ♂, ibid.



Figures 815-816
(According to Uvarov)

815—Charora pentagrammica Bol., ♂, tegmen and wing (type), 816—Ch. pentagrammica Bol., ♂, head and pronotum from above (type).

mountains in the region of Teheran . . . . . 2a. Ch. persa persa Uv.

Uvarov, 1933, Trudy Zoologicheskogo Instituta AN SSSR, (1932), I:204, Figure 4.

371 c(b). Tegmina shorter, in the ♂ they extend beyond the hind genua for not more than the width of the hind femurs. M of the hind wings in the ♂ in the basal half runs along *the thickened* veins at a distance equal to its own thickness (Figure 811). Length ♂ 13.5, tegmina 10.5-11.0 mm; ♀ unknown. —Northern Iran: province of Teheran. It is *possible that this is an independent species externally similar* to Ch. crassivenosa Sauss. . . . . .2b. Ch. persa similis B.-Bienko subsp. n.

d(a). Frontal ridge wide, *with a slight groove,* nearly flat between the antennae. Pronotum in the prozona with distinct tubercles and carina-like little ridges; metazona slightly rugose, with roundly obtuse-angled *posterior margin.* Length of ♀ 16.3, tegmina 13.5 mm; ♂ unknown. —Western Iran: Kum . . . . 2c. Ch. persa rugosa B.-Bienko subsp. n.

5 (4). *Tegmina extending only slightly* beyond the hind genua. Vertexal shield not transverse, in the ♂ barely longer than wide, with straight lateral carinae above the foveolae (Figure 813). Frontal ridge with strongly divergent lateral margins under the ocellus, widened between the antennae. Lateral carinae of pronotum sharper, entire
372 before the anterior transverse groove, fully reaching the anterior margin; posterior margin of pronotum obtuse-angled (Figure 813). Length ♂ 13, ♀ 14 mm; tegmina ♂ 11, ♀ 11 mm. —Western Iran: Kurdistan . . . . 3. Ch. kurda Uv.

Uvarov, 1933, Trudy Zoologicheskogo Instituta AN SSSR, (1932), I 205, Figure 5.

6 (3). Slender. Tegmina narrow, 5.5-6 times longer than wide (Figure 815). ♂ wings nearly twice as long as wide, *on the base itself,* not darkened; some of the cells in the widened cubital field slightly elongated lengthwise to the axis of the wing, most of the remaining cells are quadrate (Figure 815). Frontal ridge distinctly narrowed at the fastigium.

7 (8). *Frontal ridge moderately narrowed* at the fastigium. Transverse grooves on the pronotum deep, the space between them convex. Lateral lobes of pronotum with oblique carina-like tubercles. The field of the wing between R and M narrower *for its whole extent than* the field between M and CuA, the cubital field without darkening on the cross veins. Length ♂ 14-15, ♀ 16.5 mm; tegmina ♂ 12.5, ♀ 15.5 mm. —Western Iran . . . . 4. Ch. zarudnyi Uv.

Uvarov, 1933, Trudy Zoologicheskogo Instituta AN SSSR, (1932), I 203, Figure 3.

8 (7). Frontal ridge strongly narrowed at the fastigium. Transverse *grooves on the* pronotum not deep; the space between them smooth. Lateral lobes of pronotum without oblique carina-like tubercles.

The field of the wing between R and M wider, in the apical half it is wider than the field between M and CuA, the cubital field is darkened along the cross veins (Figure 815). Length ♂♀ 11-14, tegmina ♂♀ 11-13 mm. —Asia Minor. (Figure 816) . . . . 5. Ch. pentagrammica Bol.

Bolivar, 1899, Ann. Soc. Ent Belg., XLII 529, Jakobson, 1905:272, Uvarov, 1930, Eos, VI 370, Figure 12.

109. Genus Paregnatius Uv.

Uvarov, 1933, Trudy Zoologicheskogo Instituta AN SSSR, (1932), I 209.
Type of genus: P. moritzi Uv.

Differs from all other genera of the subfamily by the greatly shortened,
373 absolutely lateral lobe-like tegmina and by the complete absence of wings. Antennae filiform, hardly thickened in the distal part. Frons moderately sloping in both sexes; frontal ridge in the dorsal part with a slight groove, in profile not projecting, or in the ♂ hardly projecting forward between the antennae; vertex not wide. Pronotum (Figure 814) very short; prozona anteriorly with a distinct median carina and slight lateral carinae, metazona considerably shorter than the prozona. Prosternum between the front legs swollen, in the ♂ almost globular. Tegmina not reaching the tympanic organ which is completely developed, and hardly of smaller size than in other genera and less tapered [or sloping]. ♂ abdomen with vertical rugulae on the sides. Valves of ♀ ovipositor long, slender, ventral pair with a short pointed tooth.

In all its characters, this genus is nearest to Egnatioides Voss. Only two species distributed in eastern Iran, are known. Of these one is described for the first time.

1 (2). Tegmina broadly oval, the visible part of them hardly longer than wide. Foveolae triangular, absolutely flat. Transverse grooves on the pronotum less distinct. Length ♀ 12, tegmina 1 mm, ♂ unknown. —Eastern Iran Khorasan. (Figure 814). . . . . 1. P. moritzi Uv.

Uvarov, 1933, Trudy Zoologicheskogo Instituta AN SSSR, (1932), I 209, Figure 8

2 (1). Tegmina narrowly oval, the visible part of them 1.5-2 times longer than wide. Fovoelae roundly triangular, depressed. Transverse grooves on the pronotum more distinct. Length of ♂ 10, ♀ 12.6 mm, tegmina ♂ 0.8, ♀ 1.2 mm. —Eastern Iran· Khorasan (Germau) . . . . 2. P. saltator B.-Bienko sp. n.

110. Genus Leptoscirtus Sauss.

Saussure, 1888:72, Uvarov, 1929 in: Bodenheimer und Theodor, Ergebn. Sinai Exped, IV:97
Type of genus: L. avivulus Sauss, Egypt.

Small, thickset, smooth, externally resembling the genus Sphingonotus Fieb. Antennae not long, filiform, only slightly thickened in the distal half. Head smooth [or level]; vertex strongly inclined forward, with indistinct foveolae. Pronotum without lateral carinae both in the prozona and in the metazona; median carina slight, altogether absent in the prozona; the 3 transverse grooves are distinct, the parts of the pronotum between them convex; metazona not longer or somewhat longer than the prozona, with rounded posterior margin. Prosternum between the forelegs moderately swollen, not hemispherical. Tegmina completely developed, rather narrow, with a spurious median vein in the median field and at least in the ♀ with a spurious vein in the cubital field. Wings not specialized, of normal construction. Hind tibiae with the normal slender spines on the inner aspect. ♂ abdomen smooth on the sides; last sternite in the ♀ with obtuse-angular projecting posterior margin.

Several species are known from northwestern Africa, Arabia, and Iran. Only one species, which is peculiar to Iran, is described below; the description of the genus was also prepared from this species because the type of the genus is unknown to us in nature.

1 (1). Vertical diameter of the eye in the ♂ 1.5 times, in the ♀ slightly longer than the subocular groove. Transverse groove of mesosternum in the middle concave behind, almost to the line of the posterior margins of the lateral lobes; the lobes themselves with an acute-angular inner margin; the space between them is barely marked behind the transverse groove. Pronotum wide, saddle-shaped; its lateral lobes of the same length and height. Hind tibiae bluish. Length ♂ 13.0-13.5, ♀ 19-20 mm; tegmina ♂ 12.6-13.0, ♀ 16-17 mm. —Iran: Isfahan .... 1. L. isphabanicus Uv.

Uvarov, 1933, Trudy Zoologicheskogo Instituta AN SSSR, (1932), I-210, Figure 9.

INDEX OF COMMON NAMES†

Note: Arabic numerals refer to page numbers of the Russian original, which appear in the left-hand margin of the translation.

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† [This index and the Latin name index cover the two parts of G. Ya. Bei-Bienko's and L. L. Mishchenko's book "Locusts and Grasshoppers of the U.S.S.R. and Adjacent Countries."]

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† [The common name is not given in the Russian text.]

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† [In this case the same common name "desert locust" is given to the genus Sphingonotus Fieb.]

ALPHABETICAL INDEX OF LATIN NAMES OF LOCUSTS AND GRASSHOPPERS †

Note: 1. Arabic numerals refer to page numbers of the Russian original, which appear in the left-hand margin of the translation.

2. Names of families, subfamilies and groups of genera (tribes) are indicated by bold letters, the synonyms—by italics.

3. Pages where the description is given are indicated by bold numbers and pages with figures—by asterisks.

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† [This index has been reproduced photographically from the Russian original.]